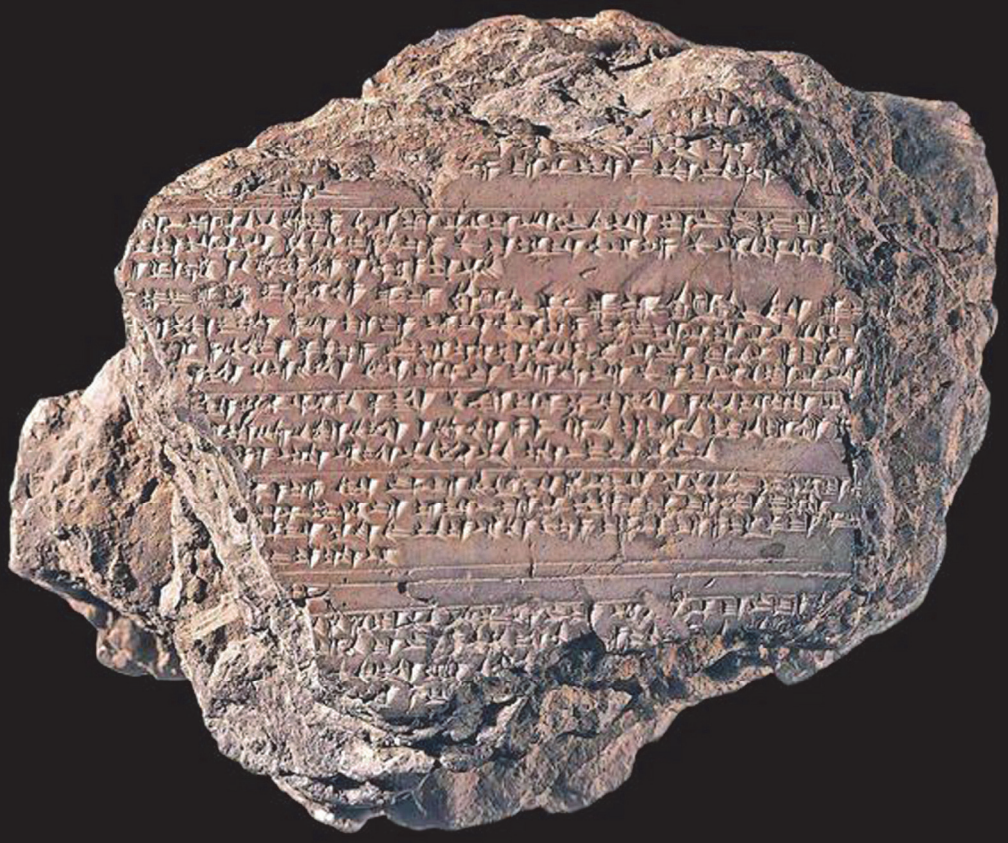
A Sketch of Proto-Indo-Anatolian Phonology



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2024

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(1) Anatolian languages; (2) Indo-European languages;
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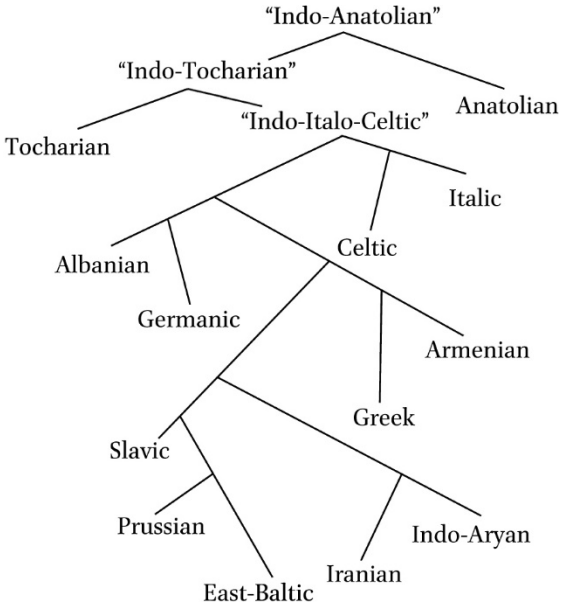
Chapter 1
General Introduction

1.1. Indo-Anatolian

Following a suggestion made by Emil Forrer, Edgar Sturtevant championed the theory that Proto-Anatolian and Proto-Indo-European were sister languages descended from an earlier common ancestor, which he called "Proto-Indo-Hittite". According to Sturtevant, this theory was based upon the observation that the Anatolian branch (mainly Hittite at the time) contained a number of very archaic features that set it apart from the other daughter languages as a group. Consequently, Sturtevant concluded that the Anatolian branch must have become separated from the main speech community before the other branches came into being. Except for a small number of supporters, such as Warren Cowgill (1965 and 1971), this theory was not embraced by the majority of Indo-Europeanists, who regarded Anatolian as simply another branch of Indo-European, comparable to all the others.

Gradually, as more work was done on Hittite and, as the remaining Anatolian languages became better understood, it became increasingly clear that Sturtevant's views were not so easily dismissed. The turning point seems to have been reached in the late 1990s, when work (namely, the application of computational cladistics to the problem of subgrouping) by Donald Ringe, Tandy Warnow, and Ann Taylor demonstrated that the Anatolian branch was, indeed, the first to become separated from the main speech community, followed, in due course, first by Tocharian (cf. Peyrot 2019), and then by the other branches. As a result, this view has now become more widely accepted, and "Indo-Hittite" has been renamed "Indo-Anatolian" to incorporate all of the Anatolian daughter languages, not just Hittite.

According to Peyrot (2019:188), the Indo-Anatolian family tree may be represented as follows (this is modified from the chart given in Ringe—Warnow—Taylor 2002:87):



1.2. The Reconstruction of the Proto-Indo-Anatolian Phonological System

One of the things that is axiomatic about all languages is that they change over time. The rate of change may differ among languages and even within languages, but change is inevitable. And yet, this fundamental axiom is embarrassingly ignored when it comes to the reconstruction of the Proto-Indo-Anatolian phonological system. The reconstructed forms given in the standard literature as the alleged ancestors of what is found in Hittite and the other Anatolian daughter languages are based almost always on the phonological system of Proto-Indo-European as reconstructed on the basis of a comparison of the non-Anatolian daughter languages, to wit (cf. Byrd 2018:2056—2057):[1]

A. Consonants:

	Labial	Dental	Palatal	Velar	Labiovelar	Postvelar
Voiceless stop	*p	*t	*$\hat{k}$	*k	*k^w	
Voiced stop	*b	*d	*$\hat{g}$	*g	*g^w	
Voiced aspirate	*b^h	*d^h	*$\hat{g}^h$	*g^h	*g^{wh}	
Fricative		*s				*h_1, *h_2, *h_3
Nasal	*m	*n				
Liquid		*r, *l				
Glide			*$\underset{\frown}{i}$		*$\underset{\frown}{u}$	

Note: The only real concession that has been made to the Anatolian data is the inclusion of laryngeals.

B. Vowels:

*i, *ī *u, *ū
*e, *ē *ə *o, *ō
*a, *ā

Byrd notes:

> For the vowels, one usually reconstructs the typologically common five-vowel inventory with a correlation of length (*$\breve{a}$, *$\breve{e}$, *$\breve{i}$, *$\breve{o}$, *$\breve{u}$).

To his credit and in contrast to most other scholars, Byrd (2018:2057) states:

> In the pages that follow, these traditional views will be maintained as the most likely state of affairs for a late stage of PIE, though it is probable that the system looked quite different at an earlier point in time.

[1] Even though I have chosen the exposition given by Byrd (2018) as one of the more modern treatments of the subject, any one of a number of other sources could have been chosen with the same result.

To my knowledge, except for Sturtevant, there has never been a systematic attempt to reconstruct the phonological system of the parent language of both the Anatolian daughter languages and the non-Anatolian daughter languages, namely, Proto-Indo-Anatolian. And yet, as astutely observed by Byrd, it is "probable that the system looked quite different at an earlier point in time". The purpose of this book is to examine the evidence of the Anatolian languages, and, on that basis, to attempt to reconstruct the phonological systems of their immediate ancestors, namely, Proto-Anatolian and Proto-Indo-Anatolian. For the most part, inner Anatolian developments will not be considered — for information on these developments, the references listed at the end of this book should be consulted.

Both Proto-Indo-Anatolian and Proto-Indo-European must have been fully natural languages, like any other language. Thus, it follows that we must strive for realism in our reconstructions — they must be based upon the concrete evidence presented by the attested daughter languages, and they must also be consistent with typological expectations. That is to say, our reconstructions must be driven exclusively by the available evidence, not by theory. The theory must be derived from the evidence — the evidence must not be distorted or cherry-picked to agree with or support a particular theory. (This point is repeated elsewhere in this book.) That is why, for example, I reject the traditional reconstruction of the Proto-Indo-European phonological system (see above), including the reconstruction of only three laryngeals (*h_1, *h_2, *h_3 [*H_1, *H_2, *H_3; *$\underset{\wedge}{e}_1$, *$\underset{\wedge}{e}_2$, *$\underset{\wedge}{e}_3$]) and the relegation of the vowel *a to a marginal status or even the denial of its existence altogether. As I have emphasized over and over again in previous publications, the traditional reconstruction of the Proto-Indo-European phonological system is, in several aspects, unquestionably not a typologically plausible system (cf. Bomhard 1981 and 2016; Gamkrelidze—Ivanov 1995; Hopper 1973; Salmons 1993).

Like all natural languages, Proto-Indo-Anatolian and Proto-Indo-European must have had internal variation, must have been in contact with other languages, and must have changed over time. Some of the internal variation is apparent in the regional vocabulary items that have been recovered as well as in the shared innovations and shared archaisms found among various daughter languages. Indications of language contact have long been suggested, most recently by Bomhard (2019a) for Pre-Indo-European and Pre-Northwest Caucasian (see the Appendices to Chapter 4). Finally, as noted above, this book deals with the recovery of possible earlier stages of development.

1.3. Contents of This Book

This book is divided into six chapters, plus references:

1. General Introduction
2. The Phonological Systems of the Anatolian Daughter Languages
3. Anatolian and the Laryngeal Theory
4. The Reconstruction of the Proto-Anatolian Consonant System
5. The Reconstruction of the Proto-Indo-Anatolian Vowel System
6. The Non-Anatolian Daughter Languages
   References

Much of what is contained in this book has been taken from previous papers and books that I have prepared — these papers and books are cited throughout the current book and are listed in the references. I have updated and enhanced this material to reflect the most recent research in the field. Needless to say, it has been quite a challenge to weed through the many conflicting viewpoints found in the literature. In so doing, I have tried to select the theories that seem to me to be most consistent with the available evidence.

Chapter 2
The Phonological Systems of The Anatolian Daughter Languages

2.1. Introduction

The first Anatolian daughter language to be discovered and described was Hittite. For many years, the remaining Anatolian daughter languages (Cuneiform and Hieroglyphic Luwian, Palaic, Kalasmaic, Kanishite,[2] Lycian, Milyan, Lydian, Carian, Pisidian, and Sidetic[3]) were not sufficiently known to be included in the discussion. That situation has since been rectified, though not all questions have been answered. In this chapter, I would like to explore the phonological systems of the Anatolian daughter languages.

In the following sections, the evidence from the major Anatolian daughter languages will be included. I would like to emphasize, however, that not every issue will be addressed, and not every point of view or proposed explanation will be considered. Instead, I will be stressing the developments in the individual daughter languages that seem to me to be best supported by the available evidence. For other points of view, the relevant entries listed in the references should be consulted.

2.2.0. Hittite

Hittite is the best attested Anatolian daughter language. Hittite texts date from the 16th to the 13th centuries BCE and number well over 30,000 tablets. During that period of time, Hittite went through several stages of development (Old Hittite, Middle Hittite, and New or Neo-Hittite) and changes in its writing system (old ductus, new ductus). New texts (cuneiform tablets) are still being discovered, while the decipherment of existing texts is ongoing. For a brief discussion of the rediscovery, together with a grammatical sketch, of the Hittite language, cf. Beckman 2011. See also Genz—Mielke (eds.) 2011.

Throughout its recorded history, Hittite was written in a form of cuneiform syllabary (cf. Archi 2010; Popova 2015),[4] which was ultimately created to record Sumerian. Indeed, Sumerian logograms (so-called "Sumerograms") regularly occur in Hittite texts (for a detailed description of Hittite writing conventions, cf. Hoffner—Melchert 2008:9—24; Sturtevant 1951:10—28). Due to the writing of Sumerograms for several common words, the underlying Hittite words are unknown. Finally, the cuneiform syllabary was an imperfect medium for writing Hittite, and, as a result, uncertainties remain concerning important aspects of Hittite phonology. For information on the origin of cuneiform writing in general, cf. Walker 1998; Woods 2020.

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[2] Kanishite (Kanišite) is a dialect of Hittite (cf. Kloekhorst 2019).

[3] Pisidian, Sidetic, Kalasmaic, and Kanishite will not be considered in this book due to the paucity of evidence. The language of Troy was also likely to have been an Anatolian daughter language, though this is still quite uncertain.

[4] A small number of texts are written in hieroglyphs.

2.2.1. Sturtevant's Law

"Sturtevant's Law" is the name given to the Hittite scribal convention according to which double writing of medial stops (though only when the cuneiform syllabary makes this possible, and even then not consistently [cf. Melchert 1994a:14]) in certain words contrasts with single writing of medial stops in certain other words. This writing convention is interpreted under Sturtevant's Law to be the method by which the Hittite scribes indicated some sort of phonemic contrast, usually taken to be a contrast between medial voiceless stops on the one hand and medial voiced stops on the other (cf. Sturtevant 1951:26—28, §53). This interpretation is based upon the observation that words exhibiting medial double writing of stops generally correspond etymologically to words in other Indo-European languages with medial voiceless stops (or their equivalents), while words exhibiting medial single writing of stops generally correspond etymologically to words in other Indo-European languages with medial voiced stops (or their equivalents), the latter being derived from what has traditionally been reconstructed as either plain voiced stops or as voiced aspirated stops at the Proto-Indo-European level. The following examples illustrate the general patterning (the Proto-Indo-European reconstructions represent the Phonemic Pitch Stage of Proto-Indo-European [Pre-Anatolian Proto-Indo-European or Proto-Indo-Anatolian], which was the stage of development just before the separation of the Anatolian daughter languages from the main speech community). Note: The Proto-Indo-European reconstructions are according to the Glottalic Model of Indo-European consonantism):

Medial Double Writing:

A. Hittite (3 pl. pres.) *li-ip-pa-an-zi* 'they smear' (also written *li-pa-a-an-zi*) ~ Sanskrit *liptá-ḥ* 'smeared, anointed'; Greek λιπαρός 'oily, greasy', λίπος 'fat, oil' < Proto-Indo-European **lip^{h}-*.
B. Hittite *a-ap-pa* 'afterwards, back, again' ~ Sanskrit *ápa* 'away, from, off'; Greek ἄπο, ἀπό 'from, away from, far from, apart from, away, off, back again' < Proto-Indo-European **hep^{h}a-* [*hap^{h}a-] (later **hep^{h}o-* [*hap^{h}o-]).
C. Hittite (3 sg. mid.) *ki-it-ta(-ri)* 'lies' ~ Sanskrit (3 sg. mid. impf.) *á-śeta* 'lay', (3 sg. mid. pres.) *śéte* 'lies'; Avestan *saēte* 'lies'; Greek (3 sg. impf.) ἔ-κειτο 'lay', (3 sg. pres.) κεῖται 'lies' < Proto-Indo-European 3 sg. mid. ending **-t^{h}a-* (later **-t^{h}o-*).
D. Hittite (acc. sg.) *ú-it-ta-an* 'year' ~ Greek ἔτος 'year'; Latin *vetus* 'old' < Proto-Indo-European **wet^{h}-*.
E. Hittite (3 sg. pres.) *lu-uk-ki-iz-zi* 'kindles, grows light' (also written *lu-uk-zi*) ~ Greek λευκός 'light, bright, brilliant, white'; Latin *lūceō* 'to shine' < Proto-Indo-European **luk^{h}-*, **lewk^{h}-*.

Medial Single Writing:

A. Hittite (nom.-acc. sg.) *ne-pí-iš* 'heaven, sky' ~ Sanskrit *nábhas-* 'sky, cloud, mist'; Greek νέφος 'cloud'; Old Church Slavic *nebo* 'sky' < Proto-Indo-European **nebas-* (later **neb^{h}os-*).

B. Hittite (nom.-acc. sg.) *pí-e-da-an* ‘place’ ~ Sanskrit *padám* ‘step, footstep, position, site’; Greek πέδον ‘the ground, earth’ < Proto-Indo-European **p^{h}et’am* (later **p^{h}et’om*).
C. Hittite (nom.-acc. sg.) *wa-a-tar* ‘water’ ~ Sanskrit *udán-* ‘water’; Greek ὕδωρ ‘water’; Gothic *watō* ‘water’; Old Church Slavic *voda* ‘water’ < Proto-Indo-European **wet’-/*wat’-/*ut’-* (later **wet’-/*wot’-/*ut’-*).
D. Hittite (1 sg. pres.) *e-it-mi* ‘I eat’ ~ Sanskrit *ádmi* ‘I eat’; Greek ἔδομαι ‘I eat’; Latin *edō* ‘I eat’ < Proto-Indo-European **ʔet’-*.
E. Hittite (nom.-acc. sg.) *i-ú-kán*, *i-ú-ga-an* ‘yoke’ ~ Sanskrit *yugám* ‘yoke’; Greek ζυγόν ‘yoke’; Latin *iugum* ‘yoke’; Gothic *juk* ‘yoke’; Old Church Slavic *igo* (< **jъgo*) ‘yoke’ < Proto-Indo-European **yuk’am* (later **yuk’om*).
F. Hittite (nom. sg.) *ḫar-ki-iš* ‘white’ ~ Sanskrit *árjuna-ḥ* ‘white, bright’; Greek ἀργός ‘shining, bright, glistening’; Latin *argentum* ‘silver’ < Proto-Indo-European **ḫ͡ḫerk’-* [**ḫ͡ḫark’-*].
G. Hittite (nom. sg.) *pár-ku-uš* ‘high’ ~ Armenian *barjr* ‘high’; Sanskrit *bṛhánt-* ‘high’ < Proto-Indo-European **bṛg-* (later **b^{h}ṛg^{h}-*).
H. Hittite (nom.-acc. sg.) *ḫé-kur*, *ḫé-gur* ‘summit, peak’ ~ Sanskrit *ágram* ‘point, tip, summit’ < Proto-Indo-European **Hek’^{w}r-*.

There also exist several well-known exceptions to Sturtevant’s Law, in which words exhibiting medial double writing of stops in Hittite correspond etymologically to words in other Indo-European daughter languages with medial voiced stops. Examples include (cf. Kronasser 1966:14; Bomhard 1984b:116):

A. Hittite *ú-uk-ga* ‘I’ (also written *ú-uk*, *ú-ga*; Melchert [1994a:7] considers the *u* to be analogical after the 2 sg. personal pronoun *tu-uk*, *tu-ga* ‘you’, while Kloekhorst [2008b:112—114] considers it to be from the Proto-Anatolian oblique form **ʔMúg*) ~ Latin *egō*, *egŏ* ‘I’; Greek ἐγώ(ν) ‘I’ < Proto-Indo-European **ʔek’-aH* (later **ʔek’-oH*).
B. Hittite 2 pl. mediopassive primary ending *-dduma* in, for example, *i-ya-at-du-ma* ‘you go’ ~ Sanskrit 2 pl. mid. secondary ending *-dhvam*; Avestan 2 pl. mid. secondary ending *-δwəm*; Greek 2 dual mid. primary and secondary ending -σθον (< **-zd^{h}wom*), 2 pl. mid. ending -σθε (< **-zd^{h}we*) < Proto-Indo-European **-dwem/*-dwam/*-dum* (later **-d^{h}wem/*-d^{h}wom/*-d^{h}um*).
C. Hittite (3 sg. pres.) *píd-da-i*, *pád-da-i* ‘to dig’ ~ Latin *fodiō* ‘to dig’; Lithuanian *bedù*, *bèsti* ‘to dig, to bury’; Gaulish *bedo-* ‘canal, ditch’; Old Church Slavic *bodǫ*, *bosti* ‘to stick, to prick’ < Proto-Indo-European **bed-/*bad-* (later **b^{h}ed^{h}-/*b^{h}od^{h}-*).
D. Hittite (acc.-dat. sg.) *am-mu-uk-ga* ‘to me’ (also written *am-mu-uk*, *am-mu-ug-ga*, *am-mu-uq-qa*, *am-mu-uk-qa*) ~ Greek (acc. sg.) ἔμε-γε ‘me’ < Proto-Indo-European **-k’e*.
E. Hittite (nom. sg.) *me-ik-ki-iš* ‘large’ ~ Greek μέγας ‘great’ < Proto-Indo-European **mek’-*.

2.2.2. The Glottalic Model of Proto-Indo-European Consonantism

At the beginning of the twentieth century, the Neogrammarian reconstruction of the Proto-Indo-European phonological system, which was based upon the principle that sound

laws admit no exceptions, was widely accepted as being a fairly accurate representation of what had existed in the Indo-European parent language. To this day, the Neogrammarian reconstruction (or variations of that reconstruction) enjoys widespread support among Indo-Europeanists. The Neogrammarian reconstruction of the Proto-Indo-European stop system, which was modeled after the phonological system found in Old Indo-Aryan (represented by Vedic and Classical Sanskrit) consisted of a four-way contrast of (1) plain voiceless stops, (2) voiceless aspirated stops, (3) plain voiced stops, and (4) voiced aspirated stops, thus (cf. Brugmann 1904:52; see also Szemerényi 1996:54—69; Burrow 1973:67):

1	2	3	4	
p	ph	b	bh	(bilabial)
t	th	d	dh	(dental)
k̂	k̂h	ĝ	ĝh	(palatal)
q	qh	g	gh	(pure velar)
q$^{\underline{u}}$	q$^{\underline{u}}$h	g$^{\underline{u}}$	g$^{\underline{u}}$h	(labiovelar)

During the last century, it became widely accepted that the traditional voiceless aspirates (column 2) should be removed from the Proto-Indo-European phonological inventory (cf. Bomhard 1986:69—71 for details). The problem with removing the voiceless aspirates, however, is that the resulting system has no typological parallels among the known languages of the world (cf. Jakobson 1971[1957]:528; Martinet 1970:115). And yet, on structural grounds, positing a three-way contrast (without the voiceless aspirates) for Proto-Indo-European instead of the four-way contrast (with the voiceless aspirates) posited by the Neogrammarians seems fully justified.

There are also problems involving the traditional plain voiced stops (column 3). One such problem, which is usually mentioned in the standard handbooks, is the unexpected statistically low frequency of occurrence of the traditional plain voiced bilabial stop **b*. Such a frequency distribution is not at all characteristic of /b/ in natural languages having a voicing contrast in stops (for details, cf. Gamkrelidze 1978:9—46). Rather, the frequency distribution points to the original *non-voiced* character of this sound in Proto-Indo-European. Indeed, the frequency distribution of all of the traditional plain voiced stops (**b*, **d*, **ĝ*, **g*, **g*$^{\underline{u}}$) points to the non-voiced character of the entire series when viewed from a typological perspective. Moreover, the traditional plain voiced stops are rarely found in pronouns and in inflectional affixes. Finally, there is the problem of the root structure constraint that prohibits the co-occurrence of two plain voiced stops in a given root.

It was in trying to find solutions to these problems in particular that the Georgian scholar Thomas V. Gamkrelidze and the Russian scholar Vjačeslav V. Ivanov, on the one hand, and the British-born American scholar Paul J. Hopper, on the other, working independently, were led to propose, in the early 1970's, a radical revision of the Proto-Indo-European stop system. Observing that the traditional plain voiced stops seemed to exhibit many of the typological characteristics of glottalized stops (ejectives), they proposed reinterpreting this series as ejectives. In their version of what has now come to be known as the "Glottalic Theory", Gamkrelidze and Ivanov made no changes to the

traditional voiced aspirates, but they reinterpreted the traditional plain voiceless stops as voiceless aspirates. In this revised interpretation, aspiration is viewed as a redundant feature, and the phonemes in question could be realized as allophonic variants with or without aspiration depending upon the paradigmatic alternation of root phonemes. The system of Gamkrelidze and Ivanov may be represented as follows (cf. Gamkrelidze 1976:403 and 2001a:84):

1	2	3	4	
ph/p	-	(p’)	bh/b	(bilabial)
th/t	-	t’	dh/d	(dental)
k̂h/k̂	-	k̂’	ĝh/ĝ	(palatal)
kh/k	-	k’	gh/g	(pure velar)
k^{u}h/k^{u}	-	k’^{u}	g^{u}h/g^{u}	(labiovelar)

The revisions proposed by Gamkrelidze, Hopper, and Ivanov provide typologically natural explanations for the problems mentioned above, specifically:

A. By reinterpreting the traditional plain voiceless stops (column 1) as voiceless aspirates, there is no longer a problem, from a typological point of view, with positing a series of voiced aspirates (column 4) for Proto-Indo-European, since the imbalance caused by the removal of the traditional voiceless aspirates (column 2) is eliminated.
B. Reinterpretation of the traditional plain voiced stops (column 3) as glottalics makes it easy to account for the statistically low frequency of occurrence of the traditional plain voiced bilabial stop **b* (which becomes a bilabial ejective **p’* in the revised system), since the glottalic member is always characterized by a low frequency of occurrence (there often being a total absence at this point of articulation) in the bilabial series in attested languages having ejectives.
C. In languages having ejectives, it is common for ejectives to be either excluded from or underrepresented in inflectional affixes and pronouns.
D. Several languages with ejectives have a constraint against the co-occurrence of two ejectives in a root. Thus, reinterpretation of the traditional plain voiced stops as glottalics provides a typologically natural explanation for the root structure constraint prohibiting the co-occurrence of two (traditional) plain voiced stops in a given root.

Moreover, the revisions proposed by Gamkrelidze, Hopper, and Ivanov provide new insights into the underlying principles governing Grassmann’s Law and Barthomomae’s Law. Finally, it may be noted that strong support for the changes proposed by Gamkrelidze, Hopper, and Ivanov is to be found in Germanic, Armenian, and (the poorly-attested) Phrygian (cf. Diakonoff—Neroznak 1985:5). According to the traditional interpretation, Germanic, Armenian, and Phrygian had been thought to have undergone “sound shifts” (in German, *Lautverschiebungen*). Under the revised interpretation, however, they are rightly seen as relic areas.

The Proto-Indo-European stop system reconstructed above may be viewed as reflecting a late stage of development. For Pre-Anatolian Proto-Indo-European (= Proto-Indo-

Anatolian), I have argued elsewhere that the traditional voiced aspirates are to be reconstructed as plain voiced stops and that the development of this series into voiced aspirates is a later development (cf. Bomhard 2023.1:114—115). That this series was not aspirated in Pre-Anatolian Proto-Indo-European will be demonstrated below.

2.2.3. From Proto-Indo-European to Proto-Anatolian

The three series reconstructed above for Proto-Indo-European by Gamkrelidze and Ivanov were preserved as separate series in Proto-Anatolian (cf. Bomhard 2019b). This is clear, for instance, from the different treatment of the voiced and voiceless velar stops before high front vowels in the Luwian branch of Anatolian (Hieroglyphic and Cuneiform Luwian along with the later Lycian). Here, the voiceless members are preserved, while the voiced member is lost; for example:

A. Cuneiform Luwian *kiša-* 'to comb, to card' ~ Hittite *kišai-* 'to comb' < Proto-Anatolian **k^{h}es-* 'to comb, to card' < Pre-Anatolian Proto-Indo-European **k^{h}es-*. Probable non-Anatolian cognates include Greek κέσκεον (< **k^{h}es-k^{h}es-* [reduplicated]) 'tow, oakum'; Old Church Slavic *češǫ*, *česati* 'to comb, to pull off'; Russian *česát'* [чесать] 'to comb, to card'; Lithuanian *kasù*, *kàsti* 'to dig, to rake'.
B. Cuneiform Luwian (nom. sg.) *(i-)iš-ša-ri-iš* 'hand'; Hieroglyphic Luwian (dat. sg.) *istri* 'hand'; Lycian *izri-* 'hand' (all with loss of an earlier initial voiced velar before high front vowel) ~ Hittite (nom.-acc. sg.) *ki-eš-šar* 'hand' < Proto-Anatolian **gēsar* 'hand' < Pre-Anatolian Proto-Indo-European **gēsr̥*. Non-Anatolian cognates include Sanskrit *hásta-ḥ* 'hand'; Old Persian *dasta-* 'hand'; Avestan *zasta-* 'hand'; Latin *praestō* (< **prae-hestōd*) 'at hand, ready'. Note: The Hieroglyphic Luwian form contains an epenthetic *t*.

More evidence is possibly to be found in the treatment of dentals initially before high front vowels and **y* in Hittite. In this case, the voiceless aspirated and plain voiced members are preserved (though **t^h-* later becomes *z-* (= /t͡s/) in this environment in Hittite, but not in the other older Anatolian languages), while the plain voiceless (from earlier glottalized) member becomes *š*, as shown in the following examples (cf. Melchert 1994a:118):

A. Hittite (dat.-loc. sg.) *šiwatti* 'day' ~ Palaic (nom. sg.) *Ti-ya-az(-)* name of the sun-god; Cuneiform Luwian (nom. sg.) *Ti-wa-az* name of the sun-god; Hieroglyphic Luwian *Tiwat-* name of the sun-god, (adj.) *tiwatami-* 'bright, sunny' < Proto-Anatolian **tyēwat-* < Pre-Anatolian Proto-Indo-European **t'yēw-*. Non-Anatolian cognates include: Sanskrit *dyáu-ḥ* 'heaven, sky, day'; Armenian *tiv* 'day'; Latin *diēs* 'day'; Old Irish *dïe*, *dïa* 'day'.
B. Hittite (gen. sg.) *ši-(i-)ú-na-aš* 'god' < Proto-Anatolian **tyŭ́-* < Pre-Anatolian Proto-Indo-European **t'yĕ́w-* (cf. Melchert 1994a:150). Non-Anatolian cognates include Greek Ζεύς 'Zeus', δῖος 'god-like, divine'; Sanskrit *devá-ḥ* 'god'; Latin *deus* 'god'.

There may be additional evidence from the later Lycian and Lydian, as Shevoroshkin (1988b) has tried to show. Shevoroshkin claims, for instance, that the (traditional) Proto-Indo-European stop system developed as follows in Lycian:

Proto-Indo-European	Milyan Initially	Milyan Medially	Lycian Initially	Lycian Medially
t	t-	-t-	t-	-t-
d	d-	-d-	dd-	-d-
dh	t-	-d-	t-	-d-

Some of the evidence that Shevoroshkin adduces to support his views, however, is questionable and is to be treated with the utmost caution. Moreover, there is other Lycian evidence, not cited by Shevoroshkin, that points to alternative interpretations (note especially Melchert's [1994a:53—54] critical assessment of Shevoroshkin's views).

There are enough clues within the Anatolian daughter languages to support the contention that the three series of stops reconstructed for the phonological system of the Indo-European parent language maintained their separate identity in Proto-Anatolian. It is not possible to tell, however, whether or not series 3 was glottalized at the Proto-Anatolian level, though there is nothing to indicate otherwise. Consequently, I assume that series 3 was glottalized in Proto-Anatolian. The most important point to bear in mind is that it is series 3 and 4 that are represented by medial single writing in Hittite and that it is series 1 that is represented by medial double writing. Thus, the Proto-Anatolian stop system is probably to be reconstructed as follows:

1	2	3	4
p^h	-	p'	b
t^h	-	t'	d
k^h	-	k'	g
k^{wh}	-	k'^w	g^w

Notes:

1. Melchert (1994a:53) assumes that series 3 and 4 merged in Proto-Anatolian. He further assumes (1994a:21) that the earlier voicing contrast was replaced by a fortis ~ lenis opposition in the older Anatolian daughter languages.
2. According to Kloekhorst (2016:226—228), series 3 was pre-glottalized in Proto-Anatolian.

2.2.4. Hittite

As mentioned above (§2.2.0), Hittite was written in a cuneiform syllabary derived from a form of Old Akkadian cuneiform in use in Northern Syria in the beginning of the second millennium BCE (cf. Gamkrelidze 1968:91—92). Now, the older cuneiform writing system, which was developed by the Sumerians, was not suited to rendering Akkadian,

much less Hittite. In Old Akkadian, voiceless, voiced, and emphatic consonants were not differentiated in the writing system, though methods were gradually developed to represent most of the Akkadian phonological distinctions. This is important, for no attempt was ever made, even after Akkadian had introduced separate syllabograms to differentiate voiceless, voiced, and emphatic consonants, to modify the Hittite writing practices to make use of the same methods to note a voicing contrast in stops. We must conclude, therefore, that the Hittite scribes did not feel that it was worthy of noting such a contrast, regardless of what the underlying phonetics may have been.

What then, if anything, does medial double writing of stops indicate if not a voicing contrast? The answer to this question can be ascertained by looking closely at the Proto-Anatolian stop system reconstructed above. Series 1 is differentiated from series 3 by the presence of aspiration in series 1 and by glottalization in series 3 and from series 4 by the absence of voicing, while series 3 and 4 are differentiated from each other by a contrast in voicing. Since it is only series 1 that is represented by medial double writing, it must have been the feature of aspiration that was considered significant by the Hittite scribes. This means that series 4 cannot have been aspirated since it, too, would have been represented by medial double writing. It also means that the opposition of medial double writing and medial single writing cannot have indicated a voicing contrast, since, if that had been the case, then series 3 would also have been represented by medial double writing, which is clearly not the case, both series 3 and 4 being represented by medial single writing. It should be noted here that Gamkrelidze (1968:94) was the first to suggest that medial double writing of stops in Hittite was used as a means to indicate the presence of aspiration (Patri 2019 reaches the same conclusion):

> The aspirated stops were rendered in Hittite cuneiform by double writing of consonants, whereas single writing was used to represent plain stops.

Gamkrelidze devotes two later articles (1982 and 2008) to a detailed analysis of Hittite consonantism, noting specifically in the first article (1982:78—79):

> In light of these facts, Sturtevant's rule acquires a completely different significance: The graphic reduplication of plosives is used to denote not the simple voiceless plosives but the corresponding aspirated phonemes, while their single writing was used for non-aspirated consonants.
>
> Thus we can reach the conclusion that the Hittite phonological system was characterized by two series of plosives: aspirated ones denoted by the graphic reduplication of the relevant consonant on the one hand, and non-aspirated ones on the other, denoted by single writing of the corresponding consonant.
>
> Three series of Proto-Indo-European plosives: 1) glottalized, 2) voiced (aspirated), and 3) voiceless (aspirated) were reduced in the Hittite phonological system into two series opposed to each other by virtue of aspiration. The differentiating feature for the phonological opposition of plosives is only the factor of aspiration (tenseness), regardless of the original voiced/unvoiced opposition of the plosives, which had phonemic significance in the Proto-Indo-European system. The correlation of Proto-Indo-European plosives depending upon whether they were voiced, voiceless or glottalized was replaced in the Hittite phonological system by the correlation on the basis of "aspiration" (tenseness).

> The feature of aspiration, which had been phonologically irrelevant with the phonemes of series 2) and 3) in Proto-Indo-European, became a phonologically significant feature in the Hittite system of plosives. In the process, the Proto-Indo-European series 1) and 2) merged into a general series of non-aspirated plosives as opposed to the series of aspirated ones, which derives from the Proto-Indo-European series 3) of voiceless (aspirated) plosives.
>
> With the adoption of the Akkadian cuneiform writing, the two series of Hittite plosives — the simple and the aspirated — were written not by the signs for voiced and voiceless plosives, as these were not differentiated in the early Akkadian writing system, but with the single and double writing of the respective consonants. Accordingly, the *single* writing of a consonant was used to express *simple* plosives, while for the Hittite *aspirated* (tense) plosives a new means of denotation was found, that is the *reduplication* of the consonant in question, by which was solved the problem of how to differentiate graphically between simple plosive and the corresponding aspirated consonant.

This does not explain the whole picture, however, for we must still account for the exceptions to Sturtevant's Law. Since the exceptions exhibit medial double writing of stops in Hittite words which correspond etymologically to words in other Indo-European languages with medial voiced stops (or their equivalents, these being derived from either earlier glottalized stops or earlier voiced aspirates at the Proto-Indo-European level), the distinguishing characteristic cannot have been aspiration. Let us take a look at each of the exceptions listed previously (as above, the Proto-Indo-European reconstructions represent the Phonemic Pitch Stage of Proto-Indo-European ["Pre-Anatolian Proto-Indo-European", that is, Proto-Indo-Anatolian]):

A. Hittite *ú-uk-ga* 'I': in this case, we are dealing with a particle added to the stem (cf. Sturtevant 1951:103, §170a), so that, in fact, we have gemination: Proto-Indo-European **ʔek'*-+-*k'e/a* > Proto-Anatolian **ek*+*ka* > Hittite (with analogical *u*) **uk*+*ka*. The particle appears in Greek as -γε (dialectal -γα).
B. Hittite 2 pl. mediopassive ending *-dduma* in, for example, *i-ya-at-du-ma* 'you go': here, the verb stem is probably to be reconstructed as **ʔy-eh-* [*ʔy-ah-] (so Sturtevant 1951:34, §61; Puhvel 1984— .1/2:334—335, however, considers *iya-* to be a thematic stem comparable to Vedic 3 sg. pres. *ayate* and derives it from earlier **eyo-*), to which the ending **-dum-* has been added. Most likely, the second laryngeal (**h*), which was lost as an independent phoneme in Hittite, has merged with the following dental, producing a geminate. Thus, double writing here indicates former presence of a laryngeal, which has left a trace in the gemination of the following stop.
C. Hittite (3 sg. pres.) *píd-da-i*, *pád-da-i* 'to dig': here, we are dealing with a Proto-Indo-European stem **bed-*/**bad-*, to which a laryngeal suffix has been added: **bed-*+-*H-*. In this case, the laryngeal has merged with the preceding stop, producing a geminate.
D. Hittite (acc.-dat. sg.) *am-mu-uk-ga* 'to me' (also written *am-mu-uk*, *am-mu-ug-ga*, *am-mu-uq-qa*, *am-mu-uk-qa*): as in the first example, we are dealing with a particle that has been added to the stem, thus producing gemination.
E. Hittite (nom. sg.) *me-ik-ki-iš* 'large': this is similar to the third example in that a laryngeal suffix has merged with a preceding stop, producing a geminate: Proto-Indo-European **mek'*-+-*Hi-* > Hittite **mekkis* (cf. Kimball 1999:261).

2.2.5. Reinterpretation of Sturtevant's Law

Thus, Sturtevant's Law is to be reinterpreted as follows: double writing of medial stops indicates stop plus something additional, that is, either aspiration or gemination, while single writing of medial stops indicates a plain stop pure and simple. It does not indicate a voicing contrast as traditionally assumed. Kloekhorst (2014:544—547) also interprets the contrast as one of length.

According to Melchert (1994a:21), medial double writing of stops in Hittite indicates fortis (= long) articulation, while single writing indicates lenis (= short) articulation. Similar views are expressed by Kimball (1999:94—95); see also Jäntti 2017, Sturtevant 1932, and Yates 2019a. Specifically, Melchert (1994a:117) notes:

> I assume that the PA [= Proto-Anatolian] contrast of voiceless/voiced stops has been reanalyzed in Hittite as one of fortis/lenis, with the realization in medial position being that of long/short. I retain the standard symbols for voiceless and voiced stops for convenience. One important contributing factor in this reanalysis was the devoicing of voiced stops in word-initial position.

Melchert's views are not necessarily incompatible with the conclusions reached here. On fortis/lenis articulation, cf. Ladefoged—Maddieson (1995:95—990, Laver (1994:344). Both Ladefoged—Maddieson and Laver caution against the careless use of these terms.

2.2.6. The Hittite Phonological System

According to Yakubovich (2020:227), the Hittite phonological system was most likely as follows (see also Melchert 1984 and 1994a: Kimball 1999; Watkins 2004:556):

Stops:[5]	/p(p)/	/t(t)/	/k(k)/	/k(k)^{w}/
	/b/	/d/	/g/	/g^{w}/
Affricate:		/t͡s/		
Fricatives:		/s/	/x/	/x^{w}/
			/ɣ/	/ɣ^{w}/
Nasals:	/m/	/n/		
Liquids:		/r/, /l/		
Glides:	/w/	/j/		
Vowels:	/i/, /i:/			/u/, /u:/
		/e/, /e:/	/o/, /o:/[6]	
		/a/, /a:/		

[5] According to Bomhard (2019b), the voiceless stops (/p(p)/, /t(t)/, /k(k)/, /k(k)^{w}/) were actually aspirated voiceless stops (/p^{h}/, /t^{h}/, /k^{h}/, /k^{wh}/). Bomhard interprets medial double writing of stops in Hittite as the means used to indicate the presence of aspiration, on the one hand, and gemination, on the other hand. This interpretation was first suggested by Thomas Gamkrelidze (1968 and 1982) — see also Patri 2019:204.

[6] The existence of /o/ and /o:/ in Hittite is controversial (for discussion, cf. Kloekhorst 2008a:35—60).

Regarding the laryngeals, Yakubovich (2020:227—229) states:

> A peculiarity that sets Hittite phonologically apart from the non-Anatolian Indo-European languages is the presence of so-called "laryngeals", namely, /x/, /ɣ/, /xʷ/, and /ɣʷ/. They are rendered in Hittite by the same signs <ḫa>, <ḫi>, <ḫu>, etc. as those used for combinations involving the Akkadian fricative /ḫ/. The system of four contrasting "laryngeals" proposed above is based on Kloekhorst (2008, 27), while certain other reconstructions assume fewer elements belonging to this class. The precise phonetic realization of Hittite laryngeals is subject to much debate, but the renderings of the phoneme /x/ in Egyptian and Ugaritic converge in the interpretation of its counterparts in the first millennium Anatolian languages leading to the conclusion that its most likely articulation in Hittite was a velar or uvular fricative (cf. Weiss 2016). This appears to agree with the assumed value of /ḫ/ in Akkadian (cf. Chapter 7).
>
> The ancient Indo-European languages outside Anatolian are commonly assumed to have lost their "laryngeals" with secondary phonological effects, such as compensatory lengthening and change in vowel quality. For example, **peh₂s-* 'to pasture, protect' is thought to have yielded Hittite *paḫš-* and **pās-* in many Indo-European groups outside Anatolia, as in Latin *pās-tor* 'shepherd' (Kimball 1999, 402). Nevertheless, the hypothesis that the loss of "laryngeals" represents a classifying innovation of non-Anatolian Indo-European, although vehemently defended in (Lehrman 1998), is now a minority view. Most Indo-Europeanists are convinced that the "laryngeals" /h₁/, /h₂/, and /h₃/ are independently required in order to explain non-trivial correspondences between non-Anatolian Indo-European languages, e.g. Sanskrit *guru-* ~ Greek βαρύς ~ Latin *grāvis* 'heavy', which are commonly reconstructed as PIE **gʷr̥h₂u-* 'heavy'. The set of such beliefs, which had begun to develop long before the decipherment of Hittite, is known as the Laryngeal Theory.
>
> At the same time, the frequently advanced claim that Hittite data provided a definite confirmation to the validity of the Laryngeal Theory is inaccurate, because the number and distribution of "laryngeals" in Hittite is different from what is typically reconstructed for Proto-Indo-European. In fact, the precise pattern of correspondence between the reconstructed Indo-European and Anatolian "laryngeals" represents one of the most controversial aspects of Anatolian historical phonology. In order to appreciate the extent of existing differences of opinion, it should suffice to compare the accounts of Melchert (1994, 64—74, 122), on the one hand, and Kloekhorst (2006, 77—95), on the other hand.

For our purposes, the following transliterated cuneiform signs were available in Hittite to write laryngeals (cf. Sturtevant 1951:13—14):

aḫ	ḫa	ḫat	saḫ
iḫ	ḫal	ḫé	taḫ
uḫ	ḫar	ḫi	túḫ
daḫ	ḫur	ḫu	
duḫ	ḫaš	maḫ	

These signs were ultimately taken over from Akkadian. As noted in the quotation above from Yakubovich, *ḫ* represents a voiceless velar fricative (IPA [x]) in Akkadian (cf. von Soden 1995:31).

As with the writing of stops, medial single as opposed to medial double writing of laryngeals is usually taken to indicate some sort of phonemic contrast. The laryngeals **H₂* and **H₃* are assumed to have been preserved in Hittite (and Anatolian in general), while **H₁* and **H₄* are assumed to have been lost.

2.3. Palaic

Palaic is very poorly documented. It is only found in a small number of cuneiform texts preserved in the Hittite national archives at Hattusas. The texts deal with cultic/ritualistic matters. Palaic had ceased to be a spoken language by the Neo-Hittite period (14th—13th centuries BCE), perhaps even earlier.

According to Melchert (2004b:586), the Palaic phonological system included at least the following consonants:

/p/		/t/		/k/	/kʷ/[7]
/b/		/d/		/g/	/gʷ/
		/t͡s/			
	/f/[8]	/s/	/ʒ/[9]	/x/[10]	
				/ɣ/	
/m/		/n/			
		/l/	/r/		
/w/			/y/		

According to Melchert (2004b:587), Palaic had the following vowels:

/i/, /i:/		/u/, /u:/
	/e/, /e:/	
	/a/, /a:/	

2.4. Cuneiform Luwian

Cuneiform Luwian is much better documented than Palaic. As the name suggests, it is the form of Luwian written in the cuneiform syllabary. It is found first in an extensive body of texts preserved in the Hittite national archives at Hattusas. The texts are primarily ritualistic in nature, and most date from the Neo-Hittite period (14th—13th centuries BCE). In addition to the specifically Cuneiform Luwian documents, a number of Luwian words are scattered here and there throughout Hittite texts, where they are indicated as such by so-called "Glossenkeil" — distinguishing wedges placed before the words in question. Lastly, there are a number of Luwian loanwords in Hittite. Cf. Yakubovich 2011:539—541 for details on the Luwian corpus.

According to Melchert (2020a:247—248), the Cuneiform Luwian phonological system was most likely as follows (see also Melchert 2004a:579—580; Kloekhorst 2008b:118):

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[7] I have added the voiceless and voiced labioverlars /kʷ/ and /gʷ/ to the table. They are missing in the original, though Melchert (2004b:586) does mention that there is "a good chance" that they should be included.

[8] /f/ is found in Hattic loanwords.

[9] /ʒ/ may represent a weak palatal fricative, though this is not entirely certain.

[10] Melchert interprets the laryngeals as voiceless and voiced pharyngeal fricatives (/ħ/ [= *H_2] and /ʕ/ [= *H_3]). However, he notes that they could have been voiceless and voiced velar fricatives (/x/ and /ɣ/) instead. The interpretation of the Palaic laryngeals as velar fricatives is now the prevailing view.

Stops:	/p/	/t/	/k/	/k^{w}/
	/b/	/d/	/g/	/g^{w}/
Affricate:		/t͡s/		
Fricatives:		/s/	/x/	/x^{w}/
			/ɣ/	/ɣ^{w}/
Nasals:	/m/	/n/		
Liquids:		/r/, /l/		
Glides:	/w/	/j/		
Vowels:	/i/, /i:/		/u/, /u:/	
		/o/, /o:/[11]		
		/a/, /a:/		

2.5. Hieroglyphic Luwian

As the name implies, Hieroglyphic Luwian is the form of Luwian written in a native hieroglyphic script. The script was used to inscribe writings on stone monuments and seals. The hieroglyphic inscriptions begin to appear from the 13th century BCE, though some writings may actually be older. The script contains over 500 signs (cf. Laroche 1960), some of which have more than one value.[12] The ultimate origin of the script is unknown.

No doubt, the phonological system given above for Cuneiform Luwian came close to what existed in Hieroglyphic Luwian. However, due to the limitations of the Hieroglyphic script only the following vowels and consonants were represented in the writing system — these are rendered in accordance with the conventional transcription:

Vowels:	a	i	u
Consonants:	p	t	k
		z	
		s	h
	m	n	
		r, l	
	w	y	

According to Sasseville (2024), the dental consonants *d*, *r*, *l*, and *n* converged into a flap /ɾ/ in Hieroglyphic Luwian under certain conditions. This is commonly referred to in the literature as “rhotacism” (cf. Arbeitman—Ayala 1981). Sasseville points out that a similar change is found in Lydian.

[11] Whether Luwian (and Hittite) had the vowels /o/ and /o:/ is quite uncertain.

[12] Two signs exhibit dual vocalization (*ra/i* and *wa/i*), while one sign exhibits triple vocalization (*la/i/u*). Moreover, some sounds could be written with several different signs.

2.6. Lycian and Milyan

Lycian and Milyan are closely-related dialects. They are written in an alphabet derived from or close to Greek. Both are considered to belong to the Luwian branch of Anatolian (cf. Adiego 2016:51; Kloekhorst 2022:67—68). The Lycian corpus is represented by a little over 150 stone inscriptions as well as over 200 coins. Only two of the extant texts are written in Milyan. In certain aspects, Milyan appears to be more archaic than Lycian.

According to Melchert (2004c:592), the Lycian phonological system included the following consonants (see also Kloekhorst 2008b:123—126 and 128):[13]

Stops:[14]	/p/		/t/[15]		/c/[16]	/k/	/kʷ/[17]
Affricate:			/t͡s/[18]				
Fricatives:		/θ/	/s/	/h/[19]	/x/[20]		
	/β/[21]		/ð/		/ɣ/		
Nasals:	/m/		/n/				
Liquids:			/r/, /l/				
Glides:	/w/			/y/			

Lycian had the following vowels (cf. Melchert 2004c:595—596) (see also Kloekhorst 2008b:119—123 and 128):

/i/		/u/
/e/		
	/a/	

Each vowel had contrasting nasalized varieties, though separate letters exist for only /ã/ and /ẽ/. Lycian vowels were subject to a widespread vowel assimilation rule — Melchert (2004c:595) renders this rule as follows: V [-high] > V [α back] /__C_0V [α back]. Melchert points out that there are many exceptions to this rule. Finally, it should be mentioned that prehistoric syncope was widespread in Lycian (cf. Melchert 2004c:596).

2.7. Lydian

Lydian is rather poorly documented and still not completely understood. There are only a little over extant 100 texts, less than 30 of which contain more than just a few words.

[13] The transcription given here is slightly different from that used by Melchert.
[14] The stops have voiceless and voiced allophones. According to Melchert (2004c:593), the voiced allophones occur after nasals and nasalized vowels, while the voiceless allophones occur elsewhere.
[15] Proto-Anatolian *k^w becomes *t* in Lycian before *i* and possibly *e*.
[16] /c/, /θ/, and /h/ are only found in Lycian, not in Milyan.
[17] /k^w/ is found only in Milyan in personal names.
[18] This sound is traditionally transcribed as *z*.
[19] /h/ is due to a change of /s/ to /h/ in Lycian — this change did not occur in Milyan.
[20] /x/ (traditionally transcribed as *χ*) appears as *q* in the name of the Storm-God *trqqñt-*. It probably represents a labialized /x/, that is, /x^w/.
[21] The phonemes shown in the table as /β/, /ð/, and /ɣ/ are traditionally transcribed as *b*, *d*, and *g*.

Lydian is written in an alphabet derived from or close to Greek. According to Melchert (2004d:603), the Lydian phonological system included the following consonants (see also Gusmani 2000—2002:21—23; Kloekhorst 2023a, summary pp. 130—131; Oreshko 2019):

Stops:[22]	/p/	/t/	/k/	/k^{w}/	
Affricates:		/t͡s/ (?)			
		/d͡z/ (?)			
Fricatives:	/f/	/s/[23]	/ç/[24]		
	/v/	/ð/ (?)			
Nasals:	/m/	/n/, /ν/[25]			
Liquids:		/l/	/r/, /λ/[26]		

Lydian probably had the following vowels (cf. Melchert 2004d:604):

/i/	/u/
/e/	/o/
/a/	

There were also two nasalized vowels, though their phonetic values are uncertain.

2.8. Carian

The Carian corpus is extremely limited. The extant texts can be dated approximately to the fourth to the third centuries BCE.

Though there has been substantial progress over the past forty years in the interpretation of the values of the Carian letters, there are still unresolved problems and disagreements (cf. Kloekhorst 2008b:137—139). As noted by Melchert (2004e:609—610) concerning the decipherment and interpretation of the values of the Carian letters:

> A new era began in 1981 when John Ray first successfully exploited the evidence of the Carian-Egyptian bilingual tomb inscriptions to establish radically new values for several Carian letters, as well as to confirm the values of others. Additional investigation, notably by Ray, Ignacio Adiego, and Dieter Schürr, has led to further revisions and refinements of the new system. The basic validity of this approach was shown by its correct prediction of Carian personal names which have subsequently appeared in Greek sources. Nevertheless, many uncertainties and unsolved problems remained, and several reputable experts were skeptical of the new interpretation of the Carian alphabet.

Melchert (2004e:610) lists the following subset of characters of the Carian alphabet:

[22] Though underlyingly voiceless, Lydian stops may have had voiced allophones in certain environments, though this is not normally indicated in the writing.
[23] /s/ is traditionally transliterated as *ś*.
[24] /ç/ is traditionally transliterated as *s*.
[25] The phonetic value of the letter transcribed as *v* is uncertain.
[26] /λ/ is probably the result of the prehistoric palatalization of /l/.

Table 23.1 A subset of characters of the Carian alphabet

Character	Transcription
𐊠	a
𐊢	d
𐊣	l
𐊤	ù
𐊦	r
𐊧	λ
𐊨	q
𐊩	b
𐊪	m
𐊫	o
𐊬	t
𐊭	š
𐊮	s
𐊯	u
𐊰	x
𐊱	n
𐊲	p
𐊳	ś
𐊴	i
𐊵	e
𐊶	w
𐊷	k
𐊸	ú
𐊹	í
𐊺	τ
𐊻	w

Three of the letters in this table are of particular importance to our understanding of the development of laryngeals in Anatolian under investigation in this paper, namely, the letters transcribed by Melchert as /q/, /x/, and /k/. Adiego (2004:242—245) assigns slightly different values for two of the letters, namely, /k/ = Melchert's /x/ and /k̂/ = Melchert's /k/. Both Adiego and Melchert agree on /q/. Several scholars (Kloekhorst, Schürr, and Simon) have adopted the new values in recent work on Carian and Anatolian, in general — Brosch (no date) provides an excellent summary of the views of these scholars, while Simon (2023) lists the lexical evidence. However, Adiego's arguments in favor of the values he assigns to these letters are highly conjectural and based upon conflicting evidence. When one takes into consideration etymological factors, it can be observed that Carian /k/ (Melchert) ~ /k̂/ (Adiego) corresponds etymologically to /k/ in older Anatolian languages (Hittite, Palaic, and Cuneiform and Hieroglyphic Luwian), while /x/ (Melchert) ~ /k/ (Adiego) corresponds etymologically to /ḫ/ in older Anatolian languages. Finally, /q/ appears to represent /xʷ/, just as in Lycian. In my opinion, this speaks in favor of the values given by Melchert in the above table and against the values assigned by Adiego.

Chapter 3
Anatolian and the Laryngeal Theory

3.1. Introduction

Let us start by reiterating the basic premises of the "Laryngeal Theory". Beginning with an article published in 1927 and culminating in the theory presented in Chapter 2 in his 1935 book *Études indoeuropéennes I*, the Polish Indo-Europeanist Jerzy Kuryłowicz (1895—1978), attempted to demonstrate that the so-called "original long vowels" reconstructed by the Neogrammarians for Proto-Indo-European were the result of a contraction of short vowels with certain consonantal elements, upon their loss. Kuryłowicz (1935:28) called these elements "consonantal *ə* (schwa)", which he wrote **ḫ* (= **H*) Kuryłowicz made additional discoveries as a result of his investigations, eventually developing the core tenets of the Laryngeal Theory, which remain to the present day. In his 1935 book (1935:28—30), Kuryłowicz summarized his findings as follows:

1. Every Proto-Indo-European original long vowel (that is to say, not arising through analogical lengthening nor through the contraction of two short vowels) is a contraction of a short vowel with one of three following consonantal elements (**ḫ₁*, **ḫ₂*, **ḫ₃*), thus: **e* + **ḫ₁* > **ē*, **e* + **ḫ₂* > **ā*, **e* + **ḫ₃* > **ō*; **o* (derived from **e* through qualitative Ablaut) + **ḫ₁* > **ō*. Notes: (1) Kuryłowicz was uncertain about whether **o* + **ḫ₂* > **ō*, due to the lack of positive examples. He was also unable to ascertain whether **ō* was the result of **o* + **ḫ₁* or of **e* + **ḫ₃*. (2) According to Sturtevant (1942:27 and 1951:49—51), **ḫ₃* did not change a contiguous **e* to **o*.
2. When **ḫ* was found between vowels, it disappeared. The resulting vowels were then contracted, thus: **aˣḫaˣ* > **aˣaˣ* > **āˣ*.
3. When **ḫ* was found between two consonants, it disappeared without a trace, except in Greek.
4. When **ḫ* was found between a consonant and an immediately following vowel, it also disappeared. However, in Indo-Iranian, **k*, **t*, **p* + prevocalic **ḫ* > **kh*, **th*, **ph*. The sound which the Neogrammarians designated as vocalic **ə* is the reduced vowel **ₑ*, which remained after the disappearance of the consonant **ḫ*.
5. Every Proto-Indo-European word beginning with a vowel has lost an initial **ḫ*. The character of the lost **ḫ* is revealed by the quality of the remaining vowel, thus: **e-* < **ḫ₁e-*, **a-* < **ḫ₂e-*, **o-* < **ḫ₃e-* (provided that "original **o*" is involved and not an Ablaut grade of **e*). On the other hand, there were also certain roots beginning with a consonant that were derived from an earlier sequence of **ḫ* + *consonant*. Such roots were simplified by the simple loss of **ḫ*, except in Greek and Armenian. In composition (and also in *sandhi*), after a preceding short vowel, the loss of initial preconsonantal **ḫ* resulted in the lengthening of that vowel: **E* + **ḫT* > *long vowel* + **T* (**E* = vowel; **T* = consonant).
6. In Hittite words of Indo-European origin, *ḫ* seems to continue **ḫ₂*. However, there is also a group of Indo-European words with **ă* in which *ḫ* is missing in Hittite.

These seem to be due to a different cause than a neighboring *$\underset{\frown}{ə}_2$. These can be attributed to the presence of a fourth type of *$\underset{\frown}{ə}$ in Proto-Indo-European, namely, *$\underset{\frown}{ə}_4$, which was lost in Hittite.

To recapitulate:

1. Proto-Indo-European had at least three, possibly four "laryngeals" (= Kuryłowicz's "consonantal *ə* [schwa]"). (Note: The term "laryngeals" refers to these sounds as a class and says nothing about their phonetic make-up (cf. Laroche 1986:134). The term was introduced by Hermann Möller [1917].)
2. Two of these laryngeals are preserved in Hittite, where they are written (initially) *$\underset{\frown}{ḫ}$-*, (medially) *-$\underset{\frown}{ḫ}$(ḫ)-*.
3. The loss of laryngeals between a short vowel and a following consonant resulted in the compensatory lengthening of these vowels.
4. Several of these laryngeals had "vowel coloring" effects — that is to say that they changed the quality of contiguous vowels.
5. Every Proto-Indo-European root began with a consonant. The roots traditionally reconstructed with an initial vowel have lost a preceding laryngeal.
6. Though not directly preserved as such, the laryngeals left discernable traces in the non-Anatolian Indo-European daughter languages. Note: **H* (*$\underset{\frown}{ə}_2$) is now known to have been partially preserved in Classical Armenian.

Kuryłowicz correlated his theory of "consonantal *ə* (schwa)" with the "coéfficients sonantiques" posited in 1878 by the young Ferdinand de Saussure and with the "laryngeals" posited by Hermann Möller (1917) on the basis of his comparative work on Indo-European and Semitic. Möller's term has stuck.

Though there have been many refinements in the Laryngeal Theory since 1935, Kuryłowicz's presentation remains the foundation of the theory. Nevertheless, though the Laryngeal Theory has now gained universal acceptance, the exact number and phonetic character of the laryngeals are still being debated.

Finally, the Proto-Indo-European reconstructions I am proposing in what follows are informed by my work on distant linguistic relationship (cf. Bomhard 2023). Hence, where they exist, references are given to the pertinent Nostratic etymologies. Moreover, the notes accompanying the individual examples are particularly important.

3.2. The Anatolian Evidence

At the time when Kuryłowicz wrote (1935), the remaining Anatolian daughter languages (Cuneiform and Hieroglyphic Luwian, Palaic, Kalasmaic, Lycian, Milyan, Lydian, Carian, Pisidian, and Sidetic[27]) were not sufficiently known to be included in the discussion. That situation has since been rectified, though not all questions have been answered. In the following sections, the evidence from the Anatolian daughter languages will be included. The following symbols: *H_1, *H_2, *H_3, *H_4 will be used in this part of the

[27] Pisidian, Sidetic, and Kalasmaic will not be considered in this book due to the paucity of evidence.

discussion when referring to the Proto-Indo-European laryngeals (other notational conventions are found in the relevant literature: *$\underset{\sim}{e}_1$, *$\underset{\sim}{e}_2$, *$\underset{\sim}{e}_3$, *$\underset{\sim}{e}_4$; *h_1, *h_2, *h_3, *h_4; etc.). Also, the Proto-Indo-European reconstructions will be given in accordance with the Glottalic Model of Proto-Indo-European consonantism (cf. Bomhard 2016; Salmons 1993) — when different, they will be immediately followed, in brackets, by the traditional reconstructions found in the standard etymological dictionaries and comparative grammars. Finally, at this point, I will not address the question of subgrouping, though I have long supported the view that the Anatolian branch was the first to split off from the main Indo-European speech community — this view is now gaining wide acceptance.

I would like to emphasize that not every issue will be addressed, and not every point of view or proposed explanation will be considered. Instead, I will be stressing what seem to me to be the principal developments of the laryngeals in the Anatolian daughter languages — that is to say, the developments that seem to be best supported by the available evidence.

3.3. Examples

The following select examples illustrate the representation of laryngeals in Anatolian (the forms, meanings, and etymologies are taken from the following: Kimball 1999; Kloekhorst 2008a; Puhvel 1984— ; Tischler 1977— ; Sturtevant 1951; Melchert 1984 and 1994a — these works, as well as the other etymological dictionaries listed in the references at the end of this paper, must be consulted for additional information). The Hittite, Palaic, Cuneiform Luwian, and Hieroglyphic Luwian forms are given in plene writing:

1. *H_1 > *Ø* in Anatolian:

Hittite (1st sg. pres. act.) *e-eš-mi* ‘to be’ (< *H_1*es-mi*); Cuneiform Luwian (3rd sg. pres. act.) *a-aš-ti* ‘to be’; Hieroglyphic Luwian (3rd sg. pres. act.) *a-sa-ti*, *á-sa-ti* ‘to be’; Palaic (3rd sg. imptv. act.) *a-aš-du* ‘to be’; Lycian (3rd sg. pres. act.) *esi* ‘to be’ ~ Sanskrit *ásti* ‘to be’; Greek ἐστί ‘to be’; Latin *est* ‘to be’; Gothic *ist* ‘to be’; Old Lithuanian *ẽsti* ‘to be’; Old Church Slavic *jestь* ‘to be’.

Hittite (1st sg. pres. act.) *e-id-mi* ‘to eat’ (< *H_1*et’-mi* [*H_1*ed-mi*]); Palaic (3rd pl. pres. act.) *a-ta-a-an-ti*, *a-da-a-an*[*-ti*] ‘to eat’; Cuneiform Luwian (3rd pl. imptv. act.) *a-da-an-du* ‘to eat’; Hieroglyphic Luwian (3rd pl. imptv. act.) *á-tà-tu-u* ‘to eat’ ~ Sanskrit *ádmi* ‘to eat, to consume, to devour’; Greek ἔδω, ἔδομαι ‘to eat, to devour; (of worms) to gnaw’; Armenian *utem* ‘to eat’; Latin *edō* ‘to eat’; Gothic *itan* ‘to eat’; Old Icelandic *eta* ‘to eat’; Norwegian *eta* ‘to eat’; Swedish *äta* ‘to eat’; Old English *etan* ‘to eat’; Old Frisian *eta*, *īta* ‘to eat’; Old Saxon *etan* ‘to eat’; Dutch *eten* ‘to eat’; Old High German *ezzan* ‘to eat’ (New High German *essen*); Lithuanian *ėdu*, *ėsti* ‘to eat’, *ėda* ‘food’; Latvian *êst* ‘to eat’; Old Prussian *īst* ‘to eat’; Old Church Slavic *jasti* ‘to eat’; Russian *jest′* [есть] ‘to eat’; Polish *jeść* ‘to eat’; Czech *jísti* ‘to eat’. [Cf. Bomhard 2023.3:814—815, no. 697, Proto-Nostratic root *ʔit’- (~ *ʔet’-): (vb.) *ʔit’- ‘to chew, to bite, to eat, to consume’; (n.) *ʔit’-a ‘the act of eating; that which is eaten: food, nourishment’.]

Hittite (1st sg. pres. mid.) *e-eš-ḫa-ḫa-ri* ‘to sit down, to seat oneself; to sit; (act.) to sit, to reside; (trans.) to settle’ (< **H₁eH₁s-*); Hieroglyphic Luwian (3rd pl. pret. act.) SOLIUM*á-sa-ta* ‘to be seated, to dwell’, *i-sà-nu-wa/i-* ‘to seat, to cause to sit’, *i-sà-tara/i-tá-* ‘throne’ ~ Sanskrit *ā́smi* ‘to sit’ (< **H₁eH₁s-mi*). [Cf. Bomhard 2023.3:785—786, no. 659, Proto-Nostratic root **ʔasʸ-* (~ **ʔəsʸ-*): (vb.) **ʔasʸ-* ‘to put, to place, to set; to sit, to be seated’; (n.) **ʔasʸ-a* ‘place, seat’; (adj.) ‘put, placed, set, established’.]

Hittite (nom.-acc. sg.) *e-eš-ḫar*, *iš-ḫar* ‘blood; bloodshed’ (< **H₁esH₂r̥*); Cuneiform Luwian (nom.-acc. sg.) *a-aš-ḫar-ša* ‘blood’; Hieroglyphic Luwian *á-sa-ha+ra/i-mi-sà* (n.) ‘blood offering’ ~ Sanskrit *ásṛk* ‘blood’ (the Sanskrit form contains an epenthetic *k*); Tocharian A *ysār* ‘blood’; Greek ἔαρ ‘blood’; Latin *assyr* ‘blood’. Note: *ḫ* is sometimes missing in Hittite, as in (nom.-acc. sg.) *e-eš-šar* (= *e-eš-ḫar*) and (gen. sg.) *e-eš-na-aš* (= *e-eš-ḫa-na-aš*). According to Kloekhorst (2008a:258), these forms represent scribal errors, while Kimball (1999:379—380) considers the loss of *ḫ* in these forms to be an archaism.

Hittite (nom. sg.) *at-ta-aš*, *ad-da-aš* ‘father’ (< **H₁at^ht^ha* [**H₁atta*]) ~ Greek ἄττα ‘daddy’; Latin *atta* ‘father’; Gothic *atta* ‘father’; Old Frisian *aththa* ‘father’; Old High German *atto* ‘father’ (Middle High German *atte*, *ätte* ‘father’); Albanian *atë* ‘father’; Old Church Slavic *otьcь* ‘father’; Russian *otéc* [отец] ‘father’; Sanskrit (f.) *attā* ‘mother’ (**atta-* ‘father’ is unattested, but note the following: Assamese *ātā* form of address to a respectable older man; Gujarati *ātāji* ‘grandfather’; Sinhalese *ātā* ‘grandfather’; Sindhi *ado* ‘brother’; Lahndi *addā* ‘father’; etc.). Note: This is a nursery word. Assuming that there was an initial laryngeal here, the only acceptable candidate is **H₁* (cf. Hamp 1965a:136 **ʔat(t)-* ??) — and original **a*. [Cf. Bomhard 2023.3:786—787, no. 680, Proto-Nostratic (n.) **ʔat^ht^ha* ‘older male relative, father’ (nursery word).]

Hittite (nom.-acc. sg. n.) *a-iš*, *a-i-iš* ‘mouth’ (< **H₁oH₁-es-*); Cuneiform Luwian (nom.-acc. sg.) *a-a-aš-ša* ‘mouth’ and, perhaps, (3rd sg. pret.) *a-aš-ša-at-ta* ‘to say’; Hieroglyphic Luwian (3rd sg. pres. act.) *á-sa₅-za-ta* ‘to speak’ ~ Sanskrit *ā́s-* ‘mouth’; Latin *ōs* ‘mouth’. Notes: (1) The reconstruction of the Proto-Indo-European form as either **h₃oh₁-os-*, *-es-* (cf. De Vaan 2008:436; Mayrhofer 1986—2001.I:81—82) or **h₁oh₃-es-* (cf. Kloekhorst 2008a:166—167), with **H₃* in either initial or medial position, is impossible since **H₃* is preserved in Hittite. (2) Sturtevant (1951: 36, §61c) reconstructs Proto-Indo-Hittite **Aōys*, **Aysos* ‘mouth’, while Puhvel (1984— .1/2:15—17) reconstructs Proto-Indo-European (nom.-acc. sg.) **A₁ʷéE₁-es* (> **ōyes* > **āyes* > **āyis* > Hittite *a-iš*, *a-i-iš*), etc.

Hittite (nom. sg. c.) *a-aš-šu-uš* ‘good; dear; favorable’ (< **H₁osu-s* [cf. Melchert 1994:63 **ósu-*]), (n.) (nom.-acc. sg.) *a-aš-šu* ‘good(ness), good things; goods, possessions’ ~ Greek ἐύς ‘good, brave, noble’; Sanskrit *sú*, *su-* ‘good’. Note: Kloekhorst (2008a:223—225) reconstructs Proto-Indo-European **h₁oh₁s-u-* (?), in part to account for the Greek variant form ἠύς ‘good, brave’ as if from Proto-Indo-

European *H_1eH_1s-*u*-. However, the initial ṅ- in this form is usually attributed to metrical lengthening (cf. Beekes 2010.I:484—485; Chantraine 1968—1980.I:388; Frisk 1970—1973.I: 594—595; Wodtko—Irslinger—Schneider 2008:246, note 6).

Hittite (3rd sg. pres. act.) *pa-a-ši*, *pa-aš-zi* ‘to swallow, to gulp down’ (< *p^hoH_1-*s*- [*poH_3s*-]); Cuneiform Luwian (3rd sg. pret. act.) *pa-aš-ta* ‘to swallow’ ~ Sanskrit (reduplicated) *píbati* ‘to drink’; Greek πῑ́νω ‘to drink’; Latin (reduplicated) *bibō* ‘to drink’; Old Church Slavic *piti* ‘to drink’. Note: The Proto-Indo-European root is typically reconstructed as *poH_3- with *H_3, the thinking here being that, since *H_3 was a voiced laryngeal, it must be reconstructed here to account for the voicing of medial *p to *b in, for example, the Sanskrit and Latin forms cited above. However, *H_3 is preserved in Anatolian, and a laryngeal reflex is missing in both Hittite and Cuneiform Luwian. Now, according to the Glottalic Model of Proto-Indo-European consonantism, the laryngeal in question in this example is not *H_3 but *H_1, thus avoiding having to reconstruct a laryngeal (*H_3) for which there is no evidence in either Hittite or Cuneiform Luwian. The Proto-Indo-European form leading to the Sanskrit and Latin derivatives would thus have been (reduplicated) *p^hi-p^hH_1-*e*-*ti* > *pi-be-ti*, assuming here that *H_1 was a glottal stop (*ʔ), which is now the common view (see below), and also assuming, consistent with the tenets of the Glottalic Model, that *-p^hʔ- > *-*b*- (cf. Hopper 1977b:70). [Cf. Bomhard 2023.2:162—164, no. 134, Proto-Nostratic root *p^huʔ- (~ *p^hoʔ-): (vb.) *p^huʔ- ‘to swell, to fatten’; (n.) *p^huʔ-*a* ‘swelling, fullness, fat(ness)’.]

Hittite enclitic demonstrative particle (nom. sg.) -*aš*, (acc. sg.) -*an*, (n. sg.) -*at* ‘he, she, it’; (nom. sg. c.) *a-ši*, *a-ši-iš* ‘that (one)’, (dat. sg.) *e-di*, *i-di*, *e-da-ni* ‘to or for him, her, it’ (< *H_1e-) ~ Sanskrit *ayám* ‘this’ (gen. sg. m./n. *a-syá*, *á-sya*; f. *a-syáḥ*), *idám* ‘this’, (f.) *iyám* ‘she, this’, *á-taḥ* ‘from this, hence’ (< *H_1e-t^ho-*s* [*H_1e-*to*-*s*]), (n.) *e-tát* ‘this, this here’, *ihá* ‘here’, *e-ṣá* (f. *e-ṣā*) ‘this’; Old Persian *a*- ‘this’, *aita*- ‘this’, *ima*- ‘this’, *iyam* this’, *idā* ‘here’; Avestan *a*- ‘this’, *aētaŋ* ‘this’, *ima*- ‘this’, *iδa* ‘here’; Latin *is*, *ea*, *id* ‘he, she, it; this or that person or thing’; Oscan *eiso*- ‘this’; Umbrian (dat. sg.) *esmei* ‘to this, to it’; Old Irish *é* ‘he, they’, *ed* ‘it’; Gothic anaphoric pronoun *is* ‘he’, *ita* ‘it’; Old Icelandic relative particle *es* (later *er*) ‘who, which, what’; Old Saxon *et*, *it* ‘it’; Old High German *er*, *ir* ‘he’, *ez*, *iz* ‘it’; Lithuanian *jìs* (< **is*) ‘he’. Note: Various extended forms must be reconstructed in Proto-Indo-European to account for developments in the daughter languages: *H_1e-/*H_1o-+-*y*/*i*- > *H_1ey-/*H_1oy-/*H_1i-; *H_1e-/*H_1o-+-t^ho-; etc. [Cf. Bomhard 2023.3: 746—751, no. 627, Proto-Nostratic demonstrative stems (originally deictic particles): proximate *ʔi- (~ *ʔe-) ‘this’; intermediate *ʔu- (~ *ʔo-) ‘that’; distant *ʔa- (~ *ʔə-) ‘that yonder, that over there’. Note: These stems regularly combined with other deictic particles: *ʔa/i/u+*na*-, *ʔa/i/u+*ša*-, *ʔa/i/u+*ma*-, *ʔa/i/u+t^ha-, *ʔa/i/u+k^ha-, *ʔa/i/u+*ya*-, etc. already in Proto-Nostratic.]

Hittite (nom. sg.) *an-na-aš* ‘mother’ (< *$H_1an(n)$-*o*-*s*); Palaic (nom. sg.) *an-na-aš* ‘mother’; Cuneiform Luwian (nom. sg.) *an-ni-iš*, *a-an-ni-iš* ‘mother’; Lycian (nom. sg.) *ẽni* ‘mother’; Lydian (nom. sg.) *ẽnaś* ‘mother’ ~ Latin *anna* ‘foster-mother’;

(?) Greek (Hesychius) ἀννίς· ‘grandmother’. Notes: (1) Hieroglyphic Luwian MATER-*nat/i* ‘mother’ may be read as /anna(i)-/ (cf. Kloekhorst 2008a:174). (2) The Proto-Indo-European ancestor of these forms is regularly reconstructed as **H₂en(n)-* or the like to account for the initial *a-* (cf., for example, Beekes 2010.I:107 **h₂en-* — Kloekhorst 2008a:174 reconstructs Proto-Anatolian **Honno-*). However, this is a nursery word, for which **H₁an(n)-*, with initial **H₁-* and original **a*, seems to be the most plausible reconstruction. [Cf. Bomhard 2023.3:775—776, no. 649, Proto-Nostratic (n.) **ʔanʸa* ‘mother, aunt’ (nursery word).]

Hittite (3rd sg. pres. active) *i-ya-(az-)zi*, *i-e-iz-zi* ‘to do, to make, to treat, to beget, to perform (duty, ritual), to celebrate (deity, feast)’ (< Proto-Anatolian **iya-* ~ **aya-* ~ **ya-/*yē-* ‘to do, to make, to perform, etc.’ < **H₁(e)yo-* originally an interrogative verb stem meaning ‘to do what?, to act in what manner?’, later simply ‘to do, to make, to perform’); Cuneiform Luwian (3rd sg. pres. pass.) *a-a-ya-ri* ‘to make’; Hieroglyphic Luwian *a(i)a-* ‘to make’; Lycian (3rd sg. pres.) *ati* (< **ayati*) ‘to make’; Lydian *i-* ‘to make’ ~ Tocharian A/B *yām-* ‘to do, to make, to commit, to effect’. [Cf. Bomhard 2023.3:789—790, no. 663, Proto-Nostratic root **ʔay-* (~ **ʔəy-*): interrogative verb stem **ʔay-* ‘to do what?, to act in what matter?’]

Hittite (imptv.) *i-it* ‘go!’ (< **H₁ey-/*H₁oy-/*H₁i-* ‘to go’); Cuneiform Luwian (3rd sg. pres.) *i-ti* ‘goes’ ~ Greek (1st sg. pres.) εἶμι ‘I go’, (1st pl. pres.) ἴμεν ‘we go’; Sanskrit (1st sg. pres.) *émi* ‘I go’, (3rd sg. pres.) *éti* ‘goes’, (1st pl. pres.) *imáḥ* ‘we go’, (3rd pl. pres.) *yánti* ‘they go’; Avestan (3rd sg. pres.) *aēiti* ‘goes’; Old Persian (3rd sg. pres.) *aitiy* ‘goes’; Latin (1st sg. pres.) *eō* ‘I go’; Old Lithuanian (1st sg. pres.) *eĩmi* ‘I go’, (3rd sg. pres.) *eĩti* ‘goes’; Old Church Slavic *idǫ*, *iti* ‘to go’; Tocharian A (1st pl.) *ymäs* ‘we go’, B (1st sg.) *yam*, *yaṁ* ‘I go’. [Cf. Bomhard 2023.3:792—794, no. 665, Proto-Nostratic root **ʔay-* (~ **ʔəy-*): (vb.) **ʔay-* ‘to go, to proceed’, (n.) **ʔay-a* ‘journey’; also Bomhard 2023.3:815—817, no. 688, Proto-Nostratic root **ʔiy-* (~ **ʔey-*): (vb.) **ʔiy-* ‘to come, to go’, (n.) **ʔiy-a* ‘approach, arrival; path, way’.]

Hittite /*ekku-/ ‘horse’ (< **H₁ekʰu-* [in Anatolian]; **H₁ekʰw-o-s* ‘horse’ [**H₁éḱu̯o-*] [in the non-Anatolian daughter languages] [literally, ‘the spirited, violent, fiery, or wild one’]); Cuneiform Luwian /*āššu-/ ‘horse’; Hieroglyphic Luwian *á-sù-wa-* /ásu-/ ‘horse’; Lycian *esbe-* ‘horse’ ~ Sanskrit *áśva-ḥ* ‘horse’; Avestan *aspa-* ‘horse’; Mycenaean *i-qo* (*hiqqʷo-*) ‘horse’; Greek ἵππος ‘horse’; Latin *equus* ‘horse’; Old Irish *ech* ‘horse’; Gothic **aihva-* ‘horse’ in **aihvatundi* ‘bramble, prickly bush’ (literally, ‘horse-thorn’); Old Icelandic *jór* (< **eχwaʀ* < **eχwaz*) ‘stallion, steed’; Old English *eoh* ‘horse’; Old Saxon *ehu-* horse’ in *ehu-skalk* ‘horse-servant’; Lithuanian (f.) *ašvà* (Old Lithuanian *ešva*) ‘mare’; Tocharian A *yuk*, B *yakwe* ‘horse’, B *yäkwaṣke* ‘little horse’. Notes: (1) Kloekhorst (2008a:237—239) reconstructs Proto-Anatolian **ʔeḱu-* ‘horse’. (2) There are no attested *o*-grade forms. (3) The Proto-Indo-European word for ‘horse’ is not in any way, shape, or form related to the Proto-Indo-European word for ‘swift’ (**ōku-*, according to

Watkins 1985:45). [Cf. Bomhard 2023.3:798—799, no. 671, Proto-Nostratic root (Eurasiatic only) **ʔekʰ-*: (vg.) **ʔekʰ-* 'to move quickly, to rage; to be furious, raging, violent, spirited, fiery, wild'; (n.) **ʔekʰ-a* 'rapid or violent movement, fury, rage'.]

Hittite (3rd sg. pres.) *a-ri* 'to arrive, to come', (3rd sg. pres.) *a-ra-(a-)i* 'to (a)rise, to lift, to raise; to (a)rouse', (3rd sg. pres.) *a-ar-aš-ki-iz-zi* 'to be arriving', (3rd sg. pres.) *ar-nu-(uz-)zi* 'to move along, to make go; to stir, to raise; to transport, to deport, to remove; to bring, to transmit, to deliver, to produce; to further, to promote', (3rd sg. pres.) *(a-)ar-aš-zi* 'to flow' (< **H₁or-*/**H₁r̥-* 'to move, to set in motion; to arise, to rise; to raise') ~ Sanskrit *árṣati* 'to flow', *árṇa-ḥ* 'undulating, surging; wave', *ṛcchá́ti* 'to go, to move, to send', *ṛṇóti* 'to go, to move, to arise'; Avestan *ar-* 'to go, to move, to come', *aurva-*, *aurvant-* 'rapid, quick', *ərənaoiti* 'to set in motion'; Old Persian *ar-* 'to move, to go or come toward', *aruvā* 'action', *aruva-* 'rapid, quick'; Greek ὄρνῡμι 'to urge on, to incite, to move, to stir oneself, to make to arise'; Latin *orior* 'to rise, to arise'. [Cf. Bomhard 2023.3:820—822, no. 691, Proto-Nostratic root **ʔor-*: (vb.) **ʔor-* 'to move rapidly, quickly, hastily; to set in motion'; (n.) **ʔor-a* 'any rapid motion: running, flowing, pouring, etc.'; (adj.) 'rapid, quick, hasty'; also Bomhard 2023.3:822—823, no. 692, Proto-Nostratic root **ʔorʸ-*: (vb.) **ʔorʸ-* 'to rise (up)', (n.) **ʔorʸ-a* 'rising movement or motion'. Note: Two separate Proto-Nostratic stems have fallen together in Proto-Indo-European: (A) **ʔor-* 'to move rapidly, quickly, hastily; to set in motion' and (B) **ʔorʸ-* 'to rise (up)'.]

Hittite (3rd sg. pres. act.) *a-ar-ki* 'to mount, to copulate (with)', (nom. pl.) *ar-ki-i-e-eš* 'testicles' (< **H₁orgʰ-*/**H₁r̥gʰ-* 'to mount, to copulate (with)', **H₁orgʰi-s* 'testicle') ~ Avestan *ərəzi* 'scrotum'; Greek ὄρχις 'testicle'; Armenian *orjikʰ* 'testicles', *orj* 'male'; Old Irish *uirge* 'testicle'; Old Icelandic *argr* 'unmanly, effeminate, cowardly; passive homosexual', *ergi* 'lust, lewdness'; Old English *earg* 'cowardly; bad, depraved'; Old Frisian *erch* (also *erg*, *arch*) 'angry, evil; wrong, bad, disgraceful; severe (wounds)', *erg* 'mean, cowardly'; Old Saxon *arug* 'mean, cowardly'; Old High German *arg*, *arag* 'mean, cowardly'; Lithuanian *aržùs* 'lusty', *eržilas* (dial. *ažžilas*) 'stallion'; Albanian *herdhë* 'testicle'. Note: Kloekhorst (2008a:203—204) reconstructs Proto-Indo-European **h₃rǵʰ-o*, **h₃órǵʰei*, with initial **H₃*. However, the Hittite evidence does not support such a reconstruction. [Cf. Bomhard 2023.3:822—823, no. 692, Proto-Nostratic (vb.) **ʔorʸ-* 'to rise (up)': extended forms (cf. Bomhard 2023.3:823—824, no. 693): (vb.) **ʔorʸ-V-g-* 'to climb on, to mount, to copulate (with)'; (n.) **ʔorʸ-g-a* 'mounting, copulation'.]

Comments:

1. One of the things that I see quite often in the literature involving laryngeals is that theory is allowed to take precedence over evidence, acting as a kind of intellectual "straitjacket" (cf. Pulleyblank 1993:65) — critical thinking requires that we free ourselves from any and all preconceived notions. This does not mean, however,

that every proposal warrants equal consideration, nor does it mean that we suspend sound judgment. Ideas that are patently crackpot should be unequivocally rejected. An example of the approach under discussion here is the Hittite word for 'mouth' (*a-iš*, *a-i-iš*) cited above. The thinking here seems to be that non-apophonic **o* in Indo-European always implies the presence of **H₃*, even when corroborating Hittite evidence is lacking. Other, more frequent examples involve the reconstruction of **H₂* to indicate the "coloring" of **e* to **a*, even when corroborating Hittite evidence is lacking. (To his credit, Kuryłowicz got around this latter conundrum quite nicely by positing **H₄* — Sturtevant, Lehmann, Mallory—Adams, and Bomhard, among others, accept Kuryłowicz's view in this matter.) This approach places the scholars reconstructing these laryngeals in the awkward position of having to explain why the laryngeals in question (**H₂* and **H₃*) are sometimes present in the Hittite data and sometimes not — in other words, of having to specify the conditioning factors leading either to the retention or to the loss of these laryngeals in identical environments. This is rarely, if ever, done, and when explanations are offered, they often seem rather ad hoc. That is not to say that these laryngeals are never lost in Hittite — that is quite a different thing than reconstructing these laryngeals without sufficient evidence. I reject this approach — in my opinion, the evidence should always take precedence over theory and should never be altered to fit the theory. When anomalies occur, they require careful analysis and viable explanations, even if it means amending or abandoning the theory or the faulty reconstructions resulting from the erroneous generalization/application of the theory — as noted by Kimball (1999:386): "Commonly cited examples of loss can usually be explained in other ways", and she gives several examples to illustrate this point. It should thus be perfectly clear from the examples listed above, as well as the examples listed by Kimball, that credible alternative explanations are almost always available to the questionable reconstructions found in the relevant literature.

2. Returning to the laryngeal under discussion in this section, as we have seen from the examples given above, **H₁* was found in the vicinity of all vowels, **e*, **a*, **o* traditionally reconstructed for Proto-Indo-European. Moreover, **H₁* did not change the quality of contiguous vowels in any way, shape, or form at the Proto-Indo-European level.
3. **o* and **a* of traditional Proto-Indo-European appear as *a* in Hittite and Palaic, while **e*, **o*, and **a* of traditional Proto-Indo-European appear as *a* in Cuneiform and Hieroglyphic Luwian. Further afield, Common Luwian *a* appears mostly as *e* in Lycian.

2. **H₂* > (1) *ḫ-* (initially), *-ḫ(ḫ)-* (medially) in Hittite, Palaic, Cuneiform Luwian, and Hieroglyphic Luwian (written *h-*, *-h(h)-*); > (2) *χ-* (initially), *-χ-*/*-g-* (medially), *-q-* (< */x^w/) in Lycian:

   Hittite (nom. sg.) *ḫu-uḫ-ḫa-aš* 'grandfather' (< **H₂ewH₂os*); Cuneiform Luwian (abl.-instr.) *ḫu-u-ḫa-ti* 'grandfather', also found in the anthroponyms *Ḫuḫḫazitis*, *Ḫūḫananis* (not in Kloekhorst, but cf. Puhvel 1984— .3:355—358); Hieroglyphic Luwian (nom. pl.) ^{AVUS}*hu-ha-zi* 'grandfather'; Lycian *χuga-* 'grandfather', also

found in the anthroponyms *Epñχuχa* and Κουγας — Melchert (1994a:289) considers the second *χ* in the name *Epñχuχa* to be secondary; perhaps Carian *quq-* 'grandfather' ~ Latin *avus* 'grandfather'; Old Irish *áue* 'grandson'; Armenian *haw* 'grandfather'; Gothic *awō* (f.) 'grandmother'. Note: According to Kloekhorst (2008a:353):

> Since Sturtevant (1928c: 163), these words are generally connected with Lat. *avus*, Arm. *haw*, etc. 'grandfather'. It is clear that Lat. *a-* and Arm. *ha-* must reflect **h₂e-*, which corresponds to Hitt. *ḫ-*. The second *-ḫḫ-* in Hittite corresponds to the acute intonation in SCr. *ùjāk* which points to a laryngeal. Since **h₃* was lost intervocalically (cf. Melchert 1987b: 23f), it is likely that we must reconstruct **h₂* here as well. Thus, we arrive at **h₂euh₂-*. The question remains why Hittite shows geminated *-ḫḫ-* where the Luwian languages show single *-ḫ-*. In my view, this problem can only be solved by assuming that this word originally was a root noun. If we reconstruct **h₂éuh₂-s*, **h₂éuh₂-m*, **h₂uh₂-ós*, we can explain that on the one hand we find the thematicized stem **h₂éuh₂-o-* in CLuw. *ḫūḫa-*, Lyc. *χuge-*, and also Lat. *avus*, Arm. *haw*, Goth. *awo*, etc., but on the other a thematicized stem **h₂uh₂-ó-* which regularly yields Hitt. *ḫuḫḫa-* without lenition of **-h₂-*. Compare *šūḫḫ-*, *šuḫḫa-* for a similar thematicization.

It should be noted, however, that medial single writing of *ḫ* is also found in Hittite in the derivatives (nom. pl.) *ḫu-u-ḫa-an-te-iš* (alongside *ḫu-uḫ-ḫa-an-te-iš*, with medial double writing) '(great)grandfather' and (nom.-acc. pl. n.) *ḫu-u-ḫa-da-al-la* 'grandfatherly' (this is probably a Luwian form, cf. Melchert 1993b:71). In view of these Hittite forms, as well as the Luwian anthroponyms cited above, Kloekhorst's conjecture cannot be considered the final word on this matter. [Cf. Bomhard 2023. 3:884—885, no. 745, Proto-Nostratic (n.) **ħaw-a* 'a relative on the mother's side'.]

Hittite (nom.-acc. sg.) *pa-aḫ-ḫur*, *pa-aḫ-ḫu-ur*, *pa-a-aḫ-ḫu-ur* 'fire' (< **pʰeH₂-ur* [**peh₂-wr̥*: Adams, Kimball, Melchert, Yates], [**peh₂-ur*: Kloekhorst], [**péxwr*: Sturtevant]); Cuneiform Luwian (nom.-acc. sg.) *pa-a-ḫu-u-ur* 'fire' and, perhaps, (3rd sg. pret.) *pa-wa-ar-it-ta* 'to light a fire', without *-ḫ-* ~ Greek πῦρ 'fire'; Armenian *hur* 'fire'; Old Icelandic *fýrr*, *fúrr* 'fire'; Old English *fȳr* 'fire'; Tocharian A *por*, B *pūwar* 'fire'. [Cf. Bomhard 2023.3:170—171, no. 140, Proto-Nostratic root **pʰaħ-* (~ **pʰəħ-*): (vb.) **pʰaħ-* 'to warm, to heat, to burn'; (n.) **pʰaħ-a* 'fire, flame, spark'; extended forms: (vg.) **pʰaħ-V-w-* 'to warm, to heat, to burn'; (n.) **pʰaħ-w-a* 'fire, flame, spark'.] Notes: (1) Kloekhorst (2008a:613—614) speculates that a labialized laryngeal may be involved here: **páHʷr*, **paHʷénas*. (2) The Luwian verb *pa-wa-ar-it-ta* 'to light a fire' may not be derived from or in any way related to *pa-a-ḫu-u-ur* 'fire'. It may tentatively be compared with Greek φαύζειν 'to roast, to fry, to parch' and φαῦσιγξ 'blister from burning, any blister', provided these are not Pre-Greek loans (cf. Beekes 2010.II:1559). Boisacq (1950:1018), on the other hand, assumes Indo-European origin for the Greek forms cited here and compares φωΐς 'blister on the skin, caused by a burn' (< **bhōu-*). Hofmann (1966:393) agrees with Boisacq. However, this etymology is rejected by Chantraine (1968—1980.II:1183), but later, Chantraine (1968—1980.II:1036) reconstructs **bhō-w-* as the source of Greek (f. pl.) φωΐδες 'blisters'. Frisk (1970—

1973.II:998 and II:1057) does not really clarify the situation. Finally, Mann (1984—1987:68) brings in Low German *bäuten* ‘to make fire’ (pt. *bödd*, pp. *bött*) (cf. Middle Low German *boten*, *buten* ‘to make fire’; East Frisian *böten* ‘to make fire, to heat’) and reconstructs Proto-Indo-European **bhaudō*, *-i̯ō* ‘(to make) fire, (to) burn’ (> Proto-Germanic **ƀautan* ‘to make fire’). On the basis of the above forms from Cuneiform Luwian, Greek, and West Germanic, we can cautiously reconstruct a Proto-Indo-European stem **b^heH_4-w/u-/*b^hoH_4-w/u-* ‘to light a fire’— an extended form of the root **b^heH_4-/*b^hoH_4-* (> **$b^hā$-/*$b^hō$-*) (not **H_2*) ‘to be bright, shining; to bring to light, to cause to appear; to make clear’ found in: Sanskrit *bhā́ti* ‘to shine, to be bright, to be luminous; to be splendid or beautiful; to be conspicuous or eminent; to appear, to seem; to show one’s self, to manifest any feeling; to be, to exist’; Avestan *bānu-* ‘splendor’; Greek φάω ‘to give light, to shine’, φᾱνός ‘light, bright, joyous’, φαίνω ‘to bring to light, to cause to appear; to make known, to reveal, to disclose; to make clear; to show forth, to display; to set forth, to expound; to inform against one, to denounce; to give light, to shine; to come to light, to be visible, to appear; to come into being; to come about; to appear to be’, φάος, φῶς ‘light, daylight; light of the eyes’ (pl. φάεα ‘eyes’); Old Irish *bán* ‘white’; Old English *bōnian* ‘to polish’; New High German *bohnen* ‘to polish, to wax (floor)’ (cf. Rix 2001:68—69 **b^heh_2-/*b^hh_2-* ‘to glisten, to shine’; Pokorny 1959:104—105 **bhā-*, **bhō-*, **bhə-* ‘to glisten’; Walde 1927—1932.II:122—123 **bhā-*; Mallory—Adams 1997:513 **bheh₂-* ‘to shine’; Wodtko—Irslinger—Schneider 2008:7—11 **b^heh_2-*; Watkins (ed.) 2000:7 **bhā-* ‘to shine’ (oldest form **$bheH_2$-*, colored to *$bhaH_2$-*, contracted to **bhā-*); Chantraine 1968—1980.II:1168—1170 **bhā-* (= **$bheH_2$-*) and II:1170—1172; Boisacq 1950:1010—1011 **bhā-* and 1014—1015; Hofmann 1966:389—390 **bhā-*; Frisk 1970—1973.II:992—994 and II:989—991; Beekes 2010.II:1545—1546 **bheh₂-* ‘to light, to shine’, II:1551—1552; Mayrhofer 1956—1980.II:493—494 **bhā-*). Needless to say, this is all quite speculative. [Cf. Bomhard 2023.2:18—19, no. 13, Proto-Nostratic root **bah-* (~ **bəh-*): (vb.) **bah-* ‘to shine’; (n.) **bah-a* ‘brilliance, brightness, splendor, beauty; light’; (adj.) ‘shining, bright, radiant’.]

Hittite (1st sg. pres. act.) *pa-aḫ-ḫa-aš-ḫi*, (1st sg. pres. mid.) *pa-aḫ-ḫa-aš-ḫa* ‘to protect, to guard, to defend; to observe (agreements), to keep (oaths), to obey (commands), to keep (a secret)’ (< **p^heH_2s-* [**peH_2s-*]); (with medial single writing) (1st sg. pres. act.) *pa-aḫ-ša-nu-mi* (causative); (?) Cuneiform Luwian (3rd sg. imptv.) *pa-ad-du* ‘to protect’ (meaning uncertain), without a laryngeal ~ Sanskrit (Vedic) *pā́ti* ‘to protect, to preserve, to keep’; Tocharian A *pās-*, B *pāsk-* ‘to guard, to protect; to practice (moral behavior), to obey (rules)’, B *-pāṣṣe* ‘behavior’. Notes: (1) The Anatolian forms are also commonly compared with the following: Latin *pāscō* ‘to cause to eat, to feed, to pasture, to drive to pasture’; Old Church Slavic *pasti* ‘to pasture, to feed, to herd’; Serbo-Croatian *pàsti* ‘to pasture, to look after’. (2) Kloekhorst points out that the form (1st pres. act.) *pa-aḫ-ḫa-aš-mi* occurs only once. He assumes that the active verb originally belonged to the *ḫi*-conjugation. [Cf. Bomhard 2023.2:106—107, no. 92, Proto-Nostratic root **$p^haħ$-* (~ **$p^həħ$-*): (vb.) **$p^haħ$-* ‘to eat’; (n.) **$p^haħ$-a* ‘food, nourishment’.]

Hittite (3rd sg. pres. act.) *la-a-ḫu-i*, *la-a-ḫu-u-i*, *la-ḫu-i*, *la-a-ḫu-wa-i*, etc.; also *la-aḫ-ḫu-uz-zi*, *la-ḫu-uz-zi*, etc. ‘(tr.) to pour, to cast (objects from metal); (intr.) ‘to (over)flow’; (nom. sg.) *la-aḫ-ḫu-uš* ‘containter’, (instr. sg.) *la-aḫ-ḫu-e-eš-ni-it* ‘pouring cup’ (< **leH₂-w/u-/*loH₂-w/u-*); Cuneiform Luwian (1st sg. pret. act.) *la-ḫu-ni-i-ḫa* ‘to wash away’; (without *ḫ*) (part.) *la-a-ú-na-i-mi-iš()*, *la-ú-na-i-*[*mi-š()*] ‘poured’, (3rd pl. pret.) *lu-u-wa-an-da* ‘to pour’, (2nd sg. impv.) *li-lu-u-wa(-a)* ‘pour!’ ~ Greek ληνός (Doric λᾱνός) ‘anything shaped like a tub or a trough: a wine-vat, a trough (for watering cattle), a watering place’ (< **lā-no-s* < **leH₂-no-s*). Note: The Anatolian forms are not related to Greek λούω ‘to wash, to bathe’, Latin *lavō* ‘to wash, to bathe’, etc., which must be derived from Proto-Indo-European **lewH₂-/*lowH₂-* ‘to wash, to bathe’ (cf. Kloekhorst 2008a:512—513). [Cf. Bomhard 2023.3:1173, no. 965, Proto-Nostratic root **laħ-* (~ **ləħ-*): (vb.) **laħ-* ‘to make flow, to pour, to moisten, to wet’; (n.) **laħ-a* ‘flowing, pouring; moistness, wetness’.)

Hittite (nom. sg.) *ḫa-at-ta-an-za* (< **ḫakt-ant-*) ‘intelligent, clever, wise’, *ḫattaḫḫ-* ‘to make clever, to instruct’, (nom. sg.) *ḫa-at-ta-a-tar* ‘intelligence, (wise) counsel, wisdom’ (< **H₂ekʰ-tʰ-* [**H₂ek-t-*]) ~ Gothic *aha* ‘mind, understanding’, *ahjan* ‘to think’, *ahma* ‘spirit’, **ahmateins* ‘inspiration’, **ahmeins* ‘spiritual’; Old Icelandic *ætla* (< **aχtilōn*) ‘to think, to mean, to suppose’, *ætlan* ‘thought, meaning, opinion’; Old English *eaht* ‘council, deliberation, consideration’, *eahtian* ‘to watch over, to hold council, to deliberate, to consider’; Old Frisian *achte* ‘consideration’, *achtia* ‘to consider’; Old High German *ahta* ‘consideration’ (New High German *Acht*), *ahtōn* ‘to consider’ (New High German *achten*). Notes: This etymology is taken from Puhvel 1984— .3:260—263. [Cf. Bomhard 2023.3:855—856, no. 721, Proto-Nostratic root **ħakʰ-* (~ **ħəkʰ-*): (vb.) **ħakʰ-* ‘to be mentally sharp, keen’; (n.) **ħakʰ-a* ‘wisdom, sound judgment, understanding’.]

Hittite (gen. sg.) *ḫal-lu-wa-aš* ‘hollow, pit’, (gen. sg.) *ḫal-lu-u-wa-aš* ‘hollow, deep’, (denominative verb, 3rd sg. pret. act.) *ḫal-lu-wa-nu-ut* ‘to put down (deep), to lower, to let deteriorate’ (< **H₂el-wo-*) ~ Latin *alvus* ‘belly, womb’, *alveus* ‘a hollow, cavity’. Note: This etymology is taken from Puhvel 1984— .3:47—49. [Cf. Bomhard 2023.3:863, no. 728, Proto-Nostratic (n.) **ħalʸ-a* ‘hole, hollow, cavity’.]

Hittite (reduplicated) (1st sg. pres. act.) [*ḫ*]*a-ma-an-ga-aḫ-ḫi*, *ḫa-ma-an-ga-mi* ‘to tie, to bind, to betroth’ (< **ḫam-ang-* < **ḫan-ang-*, through dissimilation [cf. Greek ἀνάγκη ‘force, constraint’, ἀναγκάζω ‘to force, to compel; to constrain’]) (< **H₂engʰ-*) ~ Sanskrit *aṁhú-ḥ* ‘narrow’; Greek ἄγχω ‘to compress, to press tight; to strangle’; Latin *angō* ‘to press tightly; to strangle, to throttle; to hurt, to distress’, *angor* ‘mental distress, anguish, trouble’; Gothic *aggwus* ‘narrow’; Old Icelandic *öngr* ‘narrow’; Old English *enge* ‘narrow; causing anxiety, painful, severe’; Old Saxon *engi* ‘narrow’; Dutch *eng* ‘narrow’; Old High German *angi*, *engi* ‘narrow’ (New High German *eng* ‘narrow, cramped, tight, confined’); Old Church Slavic *ǫzъ-kъ* ‘narrow’; Lithuanian *añkštas* ‘narrow, cramped, tight’. [Cf. Bomhard 2023.

3:869—871, no. 733, Proto-Nostratic root **ħan-* (~ **ħən-*): extended form: (vb.) **ħan-V-g-* ‘to tie tightly, to constrict, to make narrow; to choke, to strangle’; (n.) **ħan-g-a* ‘throat’; (adj.) ‘narrow, constricted’.]

Hittite (n.) (nom. sg.) *ḫa-ap-pí-na-az* ‘wealth’; (adj.) (nom. sg.) *ḫa-ap-pí-na-an-za* ‘wealthy, rich’ (< **H₂op^{h}-en-o-* [**H₃ep-en-o-*]); Cuneiform Luwian *ḫa-ap-pí-na-at-ta-an-za* ‘wealth, riches’ ~ Sanskrit *ápnas-* ‘possession, property’; Avestan *afnah-vant-* ‘rich in possessions’; Latin *opulens* (< **open-ont-*) ‘rich, wealthy’, *ops* ‘might, power’, *opēs* ‘resources, means, wealth’, *Ops* ‘the goddess of abundance’. Note: Proto-Indo-European **H₂op^{h}-* probably originally meant ‘to gather, to collect’, specifically, ‘to gather wealth’. [Cf. Bomhard 2023.3:872—874, no. 735, Proto-Nostratic root **ħap^{h}-* (~ **ħəp^{h}-*): (vb.) **ħap^{h}-* ‘to take, gather, or collect (with the hands or arms)’; (n.) **ħap^{h}-a* ‘that which has been gathered or collected: plenty, fullness, abundance, wealth, possessions, property; embrace, armful, handful’.]

Hittite (3rd sg. pres. act.) *ḫar-aš-zi* ‘to till (the soil)’, (nom.-acc. sg.) *ḫar-ša-u-wa-ar*, *ḫar-ša-a-u-ar* “tilled land’ (< **H₂er(H)-*) ~ Greek ἀρόω ‘to plow’; Latin *arō* ‘to plow’; Old Irish *airim* ‘to plow’; Gothic *arjan* ‘to plow’; Old Icelandic *erja* ‘to plow’; Old English *erian* ‘to plow’, *ierþ* ‘plowing’; Old High German *erran* ‘to plow’; Lithuanian *ariù*, *árti* ‘to plow, to till’; Old Church Slavic *ralu* ‘a plow’, *orjǫ*, *orati* ‘to plow’; Tocharian A *āre* ‘a plow’. Note: Kloekhorst (2008a:312—314) reconstructs Proto-Indo-European **h₂órh₃-s-ei* / **h₂rh₃-s-énti*. [Cf. Bomhard 2023.3:879—880, no. 740, Proto-Nostratic root **ħar-* (~ **ħər-*): (vb.) **ħar-* ‘to scratch, to scrape’ (> ‘to plow’ in the daughter languages); (n.) **ħar-a* ‘scraping, scratching’.]

Hittite (acc. sg.) *ḫa-aš-ša-an* ‘hearth’, (nom. sg.) *ḫa-a-aš*, *ḫa-aš-ša-aš* ‘ash(es); soda ash, potash, soap’ (< **H₂es-*) ~ (?) Greek ἄζω ‘to be dry’; Latin *āra* ‘altar’ (Old Latin *āsa*); Umbrian (dat. sg.) *ase* ‘altar’; Gothic *azgō* ‘cinder, ashes’; Old Icelandic *aska* ‘ashes’; Swedish *aska* ‘ashes’; Danish *aske* ‘ashes’; Old English *asce*, *æsce* ‘ashes’; Dutch *asch* ‘ashes’; Old High German *asca* ‘ashes’ (New High German *Asche*); Czech *ozd* ‘parched malt’, *ozdíti* ‘to dry malt’; Tocharian B *ās-* ‘to become dry, to dry out, to dry up, to parch’, *asāre* ‘dry’. Notes: (1) Kloekhorst (2008a: 318—319 and 322—323) reconstructs Proto-Indo-European **h₂éh₁-s-* to account for the long initial *ā* in Latin (and Hittite), while acknowledging that a short initial *ă* is found in the Germanic cognates. However, Lindeman (1997:57) points out that lengthened-grade is also possible (**H₂ēs-* [phonetically **H₂ās-*]). (2) Boisacq (1950: 16) and Frisk (1970—1973.I:25—26) derive Greek ἄζω ‘to be dry’ from **azd-*, extended form of **ă̆s-*, while Beekes (2010.I:26—27), among others, derives it from **h₂ed-*. [Cf. Bomhard 2023.3:881—882, no. 742, Proto-Nostratic root **ħas-* (~ **ħəs-*): (vb.) **ħas-* ‘to burn, to be hot’; (n.) **ħas-a* ‘cinder, ember, ashes; heat’.]

Hittite (nom. sg.) $^{(GIŠ)}$*ḫa-aš-ši-ka₄-aš*, $^{(GIŠ)}$*ḫa-ši-ik-ka₄-aš* ‘a tree and its fruit’ (< **H₂es-*, **H₂ŏ̄s-*) ~ Greek ὀξύη (< **ὀσκ[ε]σ-* ?) ‘a kind of beech-tree’; Armenian *haçi* ‘ash-tree’; Albanian *ah* (< **oskā*) ‘beech-tree’, *ashe* ‘holly’; Ligurian ‘Οσκίλα

'ash forest'; Latin *ornus* (< **os-en-os*) 'mountain-ash'; Old Irish *(h)uinn-ius* 'ash-tree'; Welsh *onn-en* 'ash-tree'; Breton *ounn-enn* 'ash-tree'; Old Icelandic *askr* 'ash-tree', *eski* 'ashen box'; Swedish *ask* 'ash-tree'; Old English *æsc* 'ash-tree'; North Frisian *esk* 'ash-tree'; Dutch *esch* 'ash-tree'; Old High German *ask* 'ash-tree' (New High German *Esche*); Old Prussian *woasis* 'ash-tree'; Lithuanian *úosis* (< **ōs-*) 'ash-tree'; Russian *jásen'* [ясень] 'ash-tree'. [Cf. Bomhard 2023.3:882—883, no. 743, Proto-Nostratic root **ħasʸ-* (~ **ħəsʸ-*) (used as the base to designate various tree names): (n.) **ħasʸ-a* 'a tree and its fruit'.]

Hittite (nom. sg.) *ḫa-tu-ga-aš* 'terrible, baleful, fearsome, awesome', (nom.-acc. sg.) *ḫa-tu-ga-tar* 'terror, awesomeness', (3rd sg. pres. act.) *ḫa-tu-ki-iš-zi* 'to become terrible', (3rd pl. pres. act.) (?) *ḫa-tu-ga-nu-wa-an-[zi]* 'to terrify' (< **H₂(e)t'-*, **H₂(e)t'-* [**H₂(e)d-*, **H₂(e)d-*]) ~ Greek ὀδύσσομαι 'to be wroth against, to be angry with, to hate', 'Οδυσσεύς 'Ulysses, Odysseus' (< 'Fearsome'); Latin *ōdī* 'to hate', *ŏdium* 'hatred, grudge, ill will, animosity, enmity, aversion', *odiōsus* 'hateful, odious, vexatious, offensive, unpleasant, disagreeable, annoying, troublesome'; Armenian *ateam* 'to hate', *ateli* 'hated, hostile'; Crimean Gothic *atochta* 'bad'; Old Icelandic *atall* 'fierce'; Old English *atol* 'terrible, dire, loathsome, horrid'; Breton *œz* 'horror', *œzi* 'to be terrified'. Note: Kloekhorst (2008a:336—337) compares Greek ἀτύζομαι 'to be distraught from fear, bewildered; to be distraught with grief; to be amazed at; to strike with terror or amazement' instead. Beekes (2010.1:167) supports Kloekhorst's etymology. However, as noted by Kloekhorst, *-t-* is never written double in Hittite. In my opinion, this speaks in favor of the alternative etymology given above and supported by Puhvel (1984— .3:274—277) and suggests that Greek ἀτύζομαι may be a later borrowing and not inherited from Proto-Indo-European. [Cf. Bomhard 2023.3:883—884, no. 744, Proto-Nostratic root **ħat'-* (~ **ħət'-*): (v.) (vb.) **ħat'-* 'to shake, to tremble; to be shaken, startled, frightened, terrified, afraid'; (n.) (n.) **ħat'-a* 'trembling, shaking'.]

Hittite (3rd sg. pres.) *ḫi-in-ik-zi*, *ḫi-in-ga-zi*, *ḫi-ni-ik-zi* 'to present, to deliver, to offer, to allot' (< **H₂ink^h-* [**H₂nek̂-*]) ~ Sanskrit *aśnóti* 'to reach, to come to, to arrive at, to get, to obtain; to master, to become master of; to offer'; Latin *nancior* 'to get, to obtain', *nanciscor* 'to get, to gain, to receive, to meet'; Tocharian A *ents-*, B *enk-* 'to seize, to take', B *enkalñe* 'grasping or clinging to existence; assumption, taking to oneself', B *enkäl* 'feeling, passion'. The following may belong here as well: Hittite (nom.-acc. sg.) *ḫe-en-ka-an*, *ḫi-in-kán*, *ḫi-in-ga-an*, *ḫe-e-en-kán* 'death, doom, deadly disease, plague'. Note: I assume that, not only did **H₂* lower a contiguous **e* to **a* in Proto-Indo-European, it also lowered a contiguous **i* to **e* and a contiguous **u* to **o* (cf. Bomhard 2023.1:75—77). This explains examples of *ḫe-* and *-eḫ(ḫ)-* in Hittite, where *ḫ* < **H₂*. It appears that these changes were still in progress at the time when the Anatolian branch separated from the main speech community, as evident in the fluctuation between *ḫi-* and *-iḫ(ḫ)-* and *ḫe-* and *-eḫ(ḫ)-* in Hittite (cf. Kloekhorst 2008a:339—340: "Already in the oldest texts (OS and OH/MS) we find spellings *ḫi-in-k°*, *ḫe-en-k°*, *ḫé-en-k°* besides each other"; Puhvel 1984— .3:296—300). The contrary theory, according to which *e* became *i* in this

environment, is phonetically improbable, regardless of what may have happened elsewhere. An important point needs to be made here: **i* and **u* had more than one origin in Proto-Indo-European. In some cases, **i* and **u* were original (that is to say, they were inherited from Proto-Nostratic), while, in other cases, they resulted from the stress-conditioned weakening of **ey*/**oy* (or **ye*/**yo*) and **ew*/**ow* (or **we*/**wo*), respectively. Only original **i* and **u* were lowered to **e* and **o*, respectively, when contiguous with **H_2*. When **i* and **u* resulted from the stress-conditioned weakening of **ey*/**oy* (or **ye*/**yo*) and **ew*/**ow* (or **we*/**wo*), however, they were not lowered to **e* and **o*, respectively, under the influence of **H_2*, since such a change would have disrupted the integrity of the ablaut relationship. On the other hand, it is possible to envision a scenario in which **H_2* originally did have an assimilatory effect on **i* and **u* resulting from the stress-conditioned weakening of **ey*/**oy* (or **ye*/**yo*) and **ew*/**ow* (or **we*/**wo*) as well, but where **i* and **u* were later analogically restored. No doubt, we are dealing with chronologically distinct developments here, with ablaut being older. [Cf. Bomhard 2023.3:894—895, no. 752, Proto-Nostratic root **ħin-* (~ **ħen-*): extended form: (vb.) (vb.) **ħin-V-k^h-* ‘to reach, to come to, to arrive at, to gain; to offer, to present’; (n.) **ħin-k^h-a* ‘gain, mastery, experience; offering, present’.]

Hittite (nom.-sg.) *ḫa-an-za* ‘front, front part’, (nom. sg.) *ḫa-an-te-iz-zi-iš* ‘forward, front, first; first-born, earliest; foremost’, *ḫa-an-ti* ‘in front of, before’ (< **H_2ent^h-* [**H_2ent-*]); Cuneiform Luwian (nom. sg.) *ḫa-an-te-le-eš* ‘first, foremost’, (acc. sg.) *ḫa-an-da-wa-te-en* ‘leader, chief’; Hieroglyphic Luwian *hant-* ‘face, forehead’, *hantil(i)-* ‘first, former’, *hanti* ‘against’; Lycian (3rd sg. pret. act.) *χñtawate*, *χñtewete* ‘to lead, to direct, to rule’, *χñtawata-* ‘leader, chief’ ~ Sanskrit *ánti* ‘before’, *ántya-ḥ* ‘last (in time, place, or order)’, *ánta-ḥ* ‘end, limit, boundary’; Greek ἀντί ‘opposite’, ἄντα ‘over, against, face to face’; Latin *ante* ‘before’; Oscan *ant* ‘till’; Gothic *and* ‘along, throughout, towards’, *andeis* ‘end’; Old Icelandic (prefix) *and-* ‘opposite, against, towards’, *endi*, *endir* ‘end’, *endr* ‘in times past, formerly’, *enda* ‘to end, to bring to an end’; Old English (prefix) *and-*, *ond-* ‘opposite, against, towards’, *ende* ‘end, limit, border’; Old Frisian *enda* ‘end’; Old Saxon (prefix) *and-*, *ant-* ‘opposite, against, towards’, *endi* ‘end’; Dutch *einde* ‘end’; Old High German (prefix) *ant-*, *int-*, *ent-* ‘opposite, against, towards’ (New High German *ant-*, *ent-*), *anti*, *enti* ‘end’ (New High German *Ende*); Lithuanian *añt* (earlier *antà*) ‘on, upon’; Tocharian A *ānt*, B *ānte* ‘surface, forehead’. [Cf. Bomhard 2023.3:938—940, no. 791, Proto-Nostratic (n.) **xaŋ-t^h-a* ‘the most prominent or foremost (person or thing), front, front part’.]

Hittite (3rd sg. pres.) *ḫu-ul-la-a-i* ‘to smite, to destroy’, (ptc.) *ḫu-ul-ḫu-li-ya-an-te-eš* ‘smitten’, *ḫu-ul-la-an-za-iš* ‘battle’ (< **H_2ul-*) ~ Greek ὄλλῡμι ‘to destroy, to make an end of’, ὄλεθρος ‘ruin, destruction, death’; Latin *ab-oleō* ‘to destroy’. Note: So far as I can determine, this etymology was first suggested by Couvreur (1937: 144—146), but it was subsequently rejected my most other scholars on the basis of the difference between the stem vowels of Hittite, on the one hand, and Greek and Latin, on the other hand — Cowgill (1965:146—147 and 157), for one, accepts the

comparison of the Hittite and Greek and Latin forms. However, this comparison can be revived if we consider the original form to have been *H_2ul-, which later became *H_2ol-, with *-*o*- from earlier *-*u*- under the influence of the preceding laryngeal. [Cf. Bomhard 2023.1:76 and 3:900—901, no. 757, Proto-Nostratic root *$\hbar ul$- (~ *$\hbar ol$-): (vb.) *$\hbar ul$- 'to destroy, to lay waste, to cause to perish'; (n.) *$\hbar ul$-*a* 'ruin, destruction; end, death'.]

Hittite (3rd sg. pres.) *ḫa-at-zi*, *ḫa-at-ta-i*, *ḫa-at-ta-a-i*, *ḫa-ad-da-i*; *ḫa-az-zi-zi*, *ḫa-az-zi-az-zi* 'to make a hole (in), to pierce, to prick, to stab, to slash, to perforate, to penetrate, to stick (as a means of killing), to hit (a target), to strike (especially a musical instrument), to engrave (a tablet)', (1st sg. pres.) *ḫa-at-ta-ra-a-mi* 'to prick, to incise, to engrave, to inscribe', (nom.-acc. sg.) *ḫa-at-tal-la-an* 'club, mace', (nom.-acc. sg.) *ḫa-at-ta-ra-a[n]* 'prick, awl', (nom. sg.) *ḫa-at-tal-ki-iš-na-aš* 'thorn-bush' (< *H_2et'-*H*- [*H_2ed-*H*-]); (3rd sg. pres.) *ḫa-at-ra-a-iz-zi* 'to write, to send written word (about), to report, to order, to dispatch', (nom.-acc. sg.) *ḫa-at-ri-eš-šar* 'written message, decree' (< *H_2et'-*ro*- [*H_2ed-*ro*-]); Cuneiform Luwian (3rd sg. pret.) *ḫa-at-ta-ri-it-ta* 'to prick, to pierce', (acc. sg.) *ḫa-at-ta-ra-an* 'prick'; Hieroglyphic Luwian *ha-tu+ra/i-à-s* 'letter', (imptv.) *ha-tu+ra/i+à* 'write!'; Lycian *χttadi* 'to hurt, to damage', *χdrñna* (?) 'inscription' (?) ~ Armenian *hatanem* 'to cut', *hat* 'piece, cut, slice'; Avestan *aδu* 'water-course, brook, canal'. Note: Though the comparison of Armenian *hatanem* with the Anatolian forms is semantically flawless, there are problems with the phonology, since double writing of the dental stop in Hittite points to original *-t^h- [*-*t*-], while the Armenian form points to original *-*t'*- [*-*d*-]. However, double writing of medial stops in Hittite can also indicate the former presence of a laryngeal as in (nom. sg.) *me-ik-ki-iš* 'large', which is to be derived from earlier **mek'*- plus the suffix *-*Hi*- > **mek'Hi*- > Hittite *me-ik-ki-iš*. Thus, comparison of Armenian *hatanem* with the Anatolian forms having medial double writing can be maintained if we derive the Anatolian forms from earlier *H_2et'-*H*-, which would yield Hittite *ḫatta*- as the regular outcome. Support for this interpretation may be found in Hittite *ḫatrai*-, which has consistent single writing. Thus, it is possible to envision a Pre-Anatolian root *H_2et'-, which was then extended by two separate suffixes in Proto-Anatolian proper: (A) *H_2et'-*Ho*-, yielding Hittite *ḫatta*- upon loss of the medial laryngeal, and (B) *H_2et'-*ro*-, yielding Hittite *ḫatra*-. Stem (A) was further extended by a suffix -*ra*-, giving the attested agent noun *ḫattara*- 'prick, awl', which, in turn, served as the basis of the denominative verb *ḫattarai*-. Other derivatives of stem (A) are *ḫattatta*- 'club, mace' and *ḫattalkešna*- 'thorn-bush'. The agent noun **ḫatra*-, from stem (B) and from which the denominative verb *ḫatrai*- is derived, is unattested in Hittite. [Cf. Bomhard 2023.3:940—942, no. 792, Proto-Nostratic root *xat'- (~ *$xət'$-): (vb.) *xat'- 'to cut into, to hollow out, to engrave, to prick, to pierce'; (n.) *$xat'a$ 'slice, carving, engraving, engraved line, incision'.]

Hittite (nom. sg.) *ḫu-u-ma-an-za* 'all, whole' (< *H_2um-) ~ Latin *omnis* 'all, every, whole' (cf. Couvreur 1937:144—146; Kronasser 1956:41; Pedersen 1938:165). Note: Both Polomé (1965:18) and Puhvel (1984— .3:380) reject this etymology —

Puhvel derives Latin *omnis* from **opnis*. On the other hand, Walde—Hofmann (1965—1972.II:209—210) mention Oscan *úmbn*, which points to earlier **omb-nis* and not **opnis* as the source of both the Oscan form and Latin *omnis*. **omb-nis* may contain an epenthetic *b*, in which case the original form would have been **om-ni-s*. Here, *-ni-* is a suffix. Likewise, in Hittite *ḫu-u-ma-an-za*, the stem is **ḫum-*, and the *-anz(a)* is a suffix. Thus, this comparison can be revived if we consider the original form to have been **H₂um-*, which later became **H₂om-*, with **-o-* from earlier **-u-* under the influence of the preceding laryngeal. Such an explanation overcomes the objections raised against this etymology based upon the irregular correspondence of Hittite *u* and Latin *o*. [Cf. Bomhard 2023.1:76.]

Hittite (1st sg. pres. act.) *na-aḫ-mi*, (3rd sg. pres. act.) *na-aḫ-ša-ri-ya-az-zi*, (1st sg. pret. act.) *na-aḫ-ḫu-un*, *na-a-ḫu-un* ‘to fear, to be or become afraid; to be respectful, to be careful’, (nom. sg.) *na-aḫ-ša-ra-az* ‘fear, fright; respect, reverence, awe; frightfulness’ (< **neH₂-*); Cuneiform Luwian (nom. pl.) *na-aḫ-ḫu-wa-aš-ši-en<zi>* ‘fearful’ or ‘fearsome’ (?), (3rd sg. pret. act.) *na-aḫ-ḫu-u-wa-i* ‘to be afraid, worried’ (impersonal) ~ Old Irish *nár* (< **nāsros*) ‘modest, bashful’. [Cf. Bomhard 2023.3:1143—1144, no. 941, Proto-Nostratic root **naħ-* (~ **nəħ-*): (vb.) **naħ-* ‘to tremble, to shake; to fear, to be afraid’; (n.) **naħ-a* ‘fear’.]

Hittite (3rd sg. pres. act.) *ḫu-iš-zi* ‘to live, to survive’ (< **H₂w-es-*); Hieroglyphic Luwian (nom.-acc. sg.) $^{\text{BESTIA}}$*HWI-sà+ra/i-sa*, $^{\text{BESTIA}}$*HWI-sa₅+ra/i* /hwisar/ ‘game, wild beasts’ ~ Sanskrit *vásati* ‘to dwell, to live, to inhabit; to dwell in, to abide in; to dwell or live near’; Greek (aor.) ἄεσα ‘to spend the night’; Middle Irish *fóaid* ‘to pass the night, to dwell’; Gothic *wisan* ‘to be, to remain’; Old Icelandic *vesa* ‘to be’; Old English *wesan* ‘to be, to happen’; Old High German *wesan* ‘to be’; Tocharian B *wäs-* ‘to dwell, to abide, to remain, to lie (on)’. Note: Curiously, Cuneiform Luwian has (nom.-acc. sg.) *ḫu-u-i-tar-ša* ‘wild animal’.

Hittite (nom.-acc. sg.) *me-e-ḫu-ur*, *me-e-ḫur*, *me-ḫur* ‘time’ (< **meH₂-* < **miH₂-*) ~ Sanskrit *māti-ḥ* ‘measure, accurate knowledge’, *mā́ti*, *mímāti* ‘to measure, to mete out, to mark off’; Latin *mētior* ‘to measure’; Gothic *mēl* ‘time’; Old Icelandic *mál* ‘measure; time, high time; meal’; Old English *mæþ* ‘measure, degree, proportion’, *mæl* ‘measure; (appointed) time, occasion; time for eating, meal’; Old Frisian *mēl* ‘time, mealtime’; Dutch *maal* ‘(n.) meal; (m.) time’; Old High German *māl* ‘time’ (New High German *Mal*). Note: In spite of consistent single writing of *ḫ* in Hittite, the laryngeal involved here is **H₂*, as reconstructed, for example, by Kloekhorst (2008a:567—568). I consider this to be another example of the change of original **i* to **e* under the influence of **H₂*. Puhvel (1984— .6:108—112) sardonically notes:

> The enormous, aporia-studded amount of attention expended on the etymology of *mehur* (see the account by Tischler, *Glossar* L—M 171—4; cf. Neu, *IBS* 52:184 [1987]) is a prime example of preconceptions and “theory” dragooning and hamstringing data. Derivation from IE **mē-* has been around since Hrozný (*SH* 70) but

has typically stumbled on the doctrines of "trilaryngealism" (*e*-vocalism incompatible with Hittite *h*), so that Rieken (*Stammbildung* 340) could still claim in 1999 that "all attempts to connect *mēhur* with IE **mē-* founder thereon."

Puhvel supports derivation from (traditional) **mē-* 'to measure', as do I. [Cf. Bomhard 2023.3:1101—1102, no. 913, Proto-Nostratic root **miħ-* (~ **meħ-*): (vb.) **miħ-* 'to measure, to mark off'; (n.) **miħ-a* 'measure, measurement'.]

Hittite (3rd sg. pres. act.) *ta-ru-uḫ-zi*, *tar-uḫ-zi*, *tar-ru-uḫ-zi*, *tar-ḫu-uz-zi*, etc. 'to prevail, to conquer, to be powerful, to be able', (nom.-acc. sg.) *tar-ḫu-u-i-li* 'strong, powerful', **^{d}Tarḫunna-* name of the Storm God (< **t^{h}erH$_2$-w/u-* [**terH$_2$-w/u-*]); Cuneiform Luwian ^{d}*Tarḫunt-* / ^{d}*Tarḫuwant-* name of the Storm God; Hieroglyphic Luwian *Tarhunt-*, *Tarhunza-* name of the Storm God; Lycian / Milyan *Trqqñt-* name of the Storm God; Lydian (?) *tarvτalli-* 'of Tarvra' (nom. sg. *tarvτallis*); Carian *trq(u)δ-* name of the Storm God ~ Sanskrit *tū́rvati* 'to overpower, to overcome, to excel'. Note: Kloekhorst (2008a:838) derives Lycian *Trqqñt-* first from Proto-Anatolian **trH^{w}ent-* but later, on the same page, from (Proto-Indo-European) **trh$_2$uent-*.

Hittite (nom. sg.) *ḫa-a-ra-aš*, (gen. sg.) *ḫa-ra-na-aš*) 'eagle'; Palaic *ḫa-ra-a-aš* 'eagle' (< **H$_2$or-*/**H$_2$ŗ-*) ~ Greek ὄρνις 'bird'; Armenian *oror* 'kite, gull'; Welsh *eryr* 'eagle'; Gothic *ara* 'eagle'; Old Icelandic (poet.) *ari*, *örn* (< **arnu-*) (gen. sg. *arnar*, acc. *örnu*, pl. *ernir*) 'eagle'; Old English *earn* 'eagle' (Middle English *ern(e)*, *earn*); Old High German *aro*, *arn* 'eagle' (New High German [poetic] *Aar*); Lithuanian *erẽlis* (dial. *arẽlis*) 'eagle'; Latvian *èrglis* 'eagle'; Old Prussian *arelie* 'eagle'; Old Church Slavic *orъlъ* 'eagle'; Russian *orël* [орёл] 'eagle'; Czech *orel* 'eagle'; Polish *orzeł* 'eagle'; Upper Sorbian *worjoł* 'eagle'; Lower Sorbian *jerjoł*, *jerjeł* 'eagle'; Bulgarian *orél* 'eagle'; Serbo-Croatian *órao* 'eagle'. Notes: (1) Pokorny (1959: 325—326) reconstructs Proto-Indo-European **er-* on the basis of Lithuanian *erẽlis*, but Cowgill (1965:146, fn. 2) questions the validity of this reconstruction since he takes Lithuanian *erẽlis* to be assimilated from the dialectal form *arẽlis*. Cowgill points out that the relative antiquity of the Lithuanian dialectal form is confirmed by Old Prussian *arelie*. Finally, he points out that Latvian *èrglis* has undergone even more remodeling. (2) This is another example of the change of **u* to **o* under the influence of **H$_2$*. [Bomhard 2023.3:901—902, no. 758, Proto-Nostratic (n.) **ħur-a* (and/or **ħer-a* ?) 'hawk-like bird: falcon, hawk, eagle, kite'.]

3. **H$_3$* > (1) *ḫ-* (initially), *-ḫ-* (medially) in Hittite, Palaic, Cuneiform Luwian, and Hieroglyphic Luwian (written *h-*, *-h-*); > (2) *χ-* (initially), *-χ-*/*-g-* (medially), *-q-* (< */ɣ^{w}/) in Lycian:

As noted by Kimball (1987), the reconstruction of **H$_3$* is one of the most challenging problems in Indo-European comparative linguistics, due to the ambiguity of the available evidence (see also Melchert 1994a:71, §4.1.3.3). I agree with Melchert's (1994a:72) statement: "I share the view of Normier (1980a: 58), Watkins

(1982c: 457), Bernabé (1983: 39ff), Kimball (1983 & 1987a) and others that */h₃/ is preserved initially as *ḫ-* in Hittite, Palaic and Cuneiform Luvian." Beyond that, scholars differ greatly in their opinions regarding which words are to be reconstruct with **H₃*. The one thing that seems certain, though, is that **H₂* and **H₃* were phonetically distinct. **H₃* is usually interpreted as the voiced counterpart of **H₂*. I have only included a few examples below — those that seem certain to me based mostly upon my work on distant linguistic relationship.

Hittite (nom. pl. ?) *ḫa-a-u-e-eš* 'sheep' (< **H₃owi-s*); Hieroglyphic Luwian (nom. sg.) $^{\text{OVIS.ANIMAL}}$*há-wá/í-i-sá* /hawis/ 'sheep'; Cuneiform Luwian (nom. sg.) *ḫa-a-ú-i-iš* 'sheep'; Lycian (acc. sg.) *χawã* 'sheep' ~ Sanskrit *ávi-ḥ* 'sheep'; Greek ὄϊς, οἶς 'sheep'; Latin *ovis* 'sheep'; Armenian *hov-iw* 'shepherd'; Old Irish *oí* 'sheep'; Gothic *awēþi* 'herd of sheep'; Old English *ēow*, *ēaw*, *ēw* 'sheep', *ēowu*, *ēowe* 'ewe', *ēowd*, *ēowde* 'herd of sheep'; Old Frisian *ei* 'ewe'; Old Saxon *ewwi* 'ewe'; Dutch *ooi* 'ewe'; Old High German *ouwi*, *ou* 'ewe', *ewit*, *owiti* 'herd of sheep'; Lithuanian *avìs* 'sheep'; Latvian *avs* 'sheep'; Old Church Slavic *ovьca* (< **owi-kā*) 'sheep'; Tocharian B *eye* 'sheep', *ā(u)w* 'ewe', *aiyye* 'ovine, pertaining to sheep'. Notes: (1) Kimball (1999:142) reconstructs initial **h₂-* here, but this interpretation is rejected by Kortlandt (2001:2). Kloekhorst (2008a:337—338) reconstructs **h₃eu̯i-* with initial **H₃-* as do Beekes (2010.II:1060—1061) and Derksen (2008:384 and 2015:74). (2) In my opinion, the **-o-* in the initial syllable is original here, that is to say, it is inherited from Proto-Nostratic. (3) Lycian (acc. sg.) *χavã* 'sheep' shows that initial **H₃-* became *χ-* in Lycian. However, according to Melchert (1994a:72) and Kimball (1987), initial **H₃-* was lost in Lycian. [Cf. Bomhard 2023.3:930—931, no. 785, Proto-Nostratic (n.) **ʕuw-a* (~ **ʕow-a*) 'herd of small animals, sheep and goats'.]

Hittite (nom.-acc. sg.) *ḫa-aš-ta-a-i*, *ḫa-aš-ta-i*, *ḫa-aš-da-i*, [*ḫ*]*a-aš-da-a-i* 'bone(s)' (< **H₃ost^{h}-* [**H₃ost-*]); Cuneiform Luwian (nom.-acc. sg.) *ḫa-a-aš-ša*, *ḫa-aš-ša* 'bone' ~ Sanskrit *ásthi*, (gen. sg.) *asthnáḥ* 'bone'; Greek ὀστέον 'bone'; Latin *os* 'bone'; Albanian *asht*, *ashti* 'bone'. Notes: (1) The following is also found in Hittite: (nom.-acc. sg.) É *ḫé-eš-ta-a*, (gen. sg.) É *ḫi-iš-ta-a-aš*, É *ḫi-iš-ta-aš*, É *ḫé-eš-ta-a-aš*, É *ḫé-eš-ta-aš* 'mausoleum ?'. Most scholars connect this form with *ḫa-aš-ta-a-i* 'bone(s)' as 'bone-house' > 'sepulcher, mausoleum', but Kloekhorst (2008a:346—347) prefers to see it as a borrowing ("foreignism"). Kloekhorst does not identify the source of the borrowing, but, given the fact that the paradigm "hardly shows any inflected forms" and given the specialized cultic/ritualistic meaning, I am inclined to accept Kloekhorst's views. (2) The Sanskrit form requires a laryngeal suffix to account for the aspiration: *ásthi* < **H₃ost^{h}-H-* [**H₃ost-H-*].

Hittite (3rd sg. pres. act.) *ḫar-ap-zi* 'to separate oneself and (re)associate oneself elsewhere' (< **H₃or-b^{h}-*) ~ Sanskrit *árbha-ḥ* 'little, small; child'; Armenian *orb* 'orphan'; Greek ὀρφανός 'orphan, without parents, fatherless; (metaph.) abandoned, bereft'; Latin *orbus* 'bereft, deprived by death of a relative or other dear one; bereaved (of); childless; an orphan'; Old Irish *orb* 'heir', *orb(b)e*, *orpe*

'inheritance'; Gothic *arbi* 'inheritance', *arbja* 'heir' (f. *arbjō* 'heiress'); Old Icelandic *arfi* 'heir, heiress', *arfr* 'inheritance, patrimony', *erfa* 'to inherit', *erfð* 'inheritance'; Old Swedish *arve*, *arver* 'heir'; Danish *arv* 'heir'; Norwegian *arv* 'heir'; Old English *ierfa*, *irfa* 'heir', *ierfe* 'inheritance, bequest, property', *erfe*, *irfe*, *yrfe* 'inheritance, (inerited) property', *irfan*, *yrfan* 'to inherit'; Old Frisian *erva* 'heir', *erve* 'inheritance, inherited land, landed property'; Old Saxon *erƀi* 'inheritance'; Middle Dutch *erve* 'heir'; Old High German *arbi*, *erbi* 'inheritance', *arbeo*, *erbo* 'heir' (New High German *Erbe* 'inheritance; heir'); Old Church Slavic *rabъ* 'servant, slave'; Russian *rab* [раб] 'slave, serf, bondsman' (f. *rabá* [раба] 'slave, serf, bondmaid'). [Cf. Bomhard 2023.3:950—952 no. 801, Proto-Nostratic root **γor-*: (vb.) **γor-* 'to leave, to go away, to depart, to separate, to abandon'; (n.) **γor-a* 'leaving, departure; separation; abandonment'; extended form: (vb.) **γor-V-b-* 'to leave, to go away, to depart, to separate, to abandon'; (n.) **γor-b-a* 'leaving, departure; separation; abandonment'.]

Hittite (nom.-acc. sg.) *še-e-ḫur*, *še-e-ḫu-ur*, *še-e-ḫu-wa-ar* 'urine', (3rd sg. pret. act.) *še-e-ḫu-ri-ya-*[*a*]*t* 'to urinate', (nom. sg.) *še-e-ḫu-ga-ni-ya-u-wa-an-za* 'besmeared with urine' (< **seH₃-ur* < **siH₃-ur*). Notes: (1) There are no known cognates, either in the other Anatolian languages or in the non-Anatolian Indo-European daughter languages. (2) Later in this chapter, I am going to explain why I believe that it is extremely probable that **H₂* and **H₃* had exactly the same vowel-coloring effects, in this case, **i* > **e* under the influence of **H₃*. (3) Given the ambiguities involved, derivation of Hittite (nom.-acc. sg.) *še-e-ḫur*, *še-e-ḫu-ur*, *še-e-ḫu-wa-ar* 'urine' from **seH₂-ur* (< **siH₂-ur*), with **H₂* instead of **H₃*, is also a possibility. (4) As observed by Kloekhorst (2008a:741—742): "The noun shows the same inflection as *mēḫur* / *mēḫun-* 'time'." (5) Kloekhorst's conjecture that Hittite *še-e-ḫur* may be a loan from Palaic cannot be proven. (6) Sturtevant (1951:50, §75) also reconstructs **H₃* here (Indo-Hittite **seγwr*), but for different reasons.

4. **H₄* > *Ø* in Anatolian:

Hittite (nom. sg.) *al-pa-aš*, *al-pa-a-aš* '(storm) cloud' (< **H₄el-bʰo-s*) ~ (?) Greek ἄλφος 'whiteness, white leprosy'; Latin *albus* 'white'; Umbrian *alfu* 'white'; Old Icelandic *elptr* 'swan' (named for its white color); Old English *ielfetu* 'swan'; Old High German *albiz* 'swan'; Old Church Slavic *lebedь* 'swan' (< Proto-Slavic **olbǭdь*; **oldǭtь*; **elbedь*; **elbǫtь* 'swan' [cf. Derksen 2008:365—366]); Polish *łabędź* 'swan'; Czech *labud* 'swan'; Russian *lébed'* [лебедь] 'swan'. Note: This etymology is rejected by Kloekhorst (2008a:169), mainly on semantic grounds. However, he also points out that he has "no better IE etymology for this word." See also Puhvel (1984— .1/2:37—38), who also questions this etymology on semantic grounds. However, the proposed alternative etymologies mentioned by Puhvel fare even worse (cf. Woodhouse 2012:226—227). [Cf. Bomhard 2023.3:837—838, no. 705, Proto-Nostratic root **hal-* (~ **həl-*): (vb.) **hal-* 'to light up, to shine, to radiate, to brighten up, to beam forth'; (n.) **hal-a* 'clearness, brightness, radiance, purity'; (adj.) 'clear, pure, bright, shining, radiant'.]

Hittite (adv.; postpos.) *a-ap-pa* ‘behind, afterwards; back, again, further’, *a-ap-pa-an* (adv.) behind, after(wards)’ (< **H₄epʰo* [**H₄epo*]); Cuneiform Luwian *a-ap-pa* ‘back, again, after’; Hieroglyphic Luwian *á-pa-na* ‘after, behind, again’; Lycian (adv.) *epñ* ‘afterwards’, *epñte* (adv.) ‘thereafter’, *epre/i-* (adj.) ‘back-, rear-’ ~ Sanskrit *ápa* ‘away, forth, back’; Old Persian (prefix) *apa-* ‘away’; Greek ἄπο, ἀπό ‘off, away, back’; Latin *ab* ‘away from’; Gothic *af* ‘of, from, by, away from’; Old Icelandic *af* ‘off, from’; Old English *of* ‘from, away from’; Old Frisian *af*, *of* ‘off, from, away from’; Old Saxon *af* ‘off, from, away from’; Dutch *af* ‘off, down’; Old High German *ab*, *aba* ‘off, from, away from’ (New High German *ab*). [Cf. Bomhard 2023.3:847, no. 712, Proto-Nostratic root **hapʰ-* (~ **həpʰ-*): (vb.) **hapʰ-* ‘to turn, to turn away, to turn back’; (n.) **hapʰ-a* ‘the act of turning away, turning back, overturning’; (adj.) ‘turned away from, turned back, overturned’.]

Hittite (nom.-acc. sg.) *a-ra-a-u-(wa-)aš* ‘free’, (1st sg. pres.) *a-ra-wa-aḫ-ḫi* ‘to set free, to make free’ (< **h₄er-wo-*/**h₄or-wo-*); Lycian *arawa* ‘free’, *arawã* ‘exempt from tax’, ’Ερεύας /*erewa-/ ‘free(city)’ ~ Lithuanian *árvas* ‘free’. Notes: (1) Puhvel’s (1984— .1/2:119—121) rejection notwithstanding, the most convincing Indo-European cognate remains Lithuanian *árvas* ‘free’. See also Tischler 1977— :53—55. (2) This etymology is accepted by Gamkrelidze—Ivanov (1995.I:397—398 and I:781), who reconstruct **arw-* (I:397) and **arwo-* ‘free agriculturalist’ (I:781). However, the putative Latin, Middle Irish, Greek, and Armenian cognates adduced by Gamkrelidze—Ivanov do not belong here. [Cf. Bomhard 2023.3:851, no. 717, Proto-Nostratic root **her-* and/or **hor-*: (vb.) **her-* and/or **hor-* ‘to escape, to flee, to run away’; (n.) **her-a* and/or **hor-a* ‘escape, flight’; (adj.) ‘escaped, liberated, free’.]

Hittite (nom. sg.) *ta-ya-az-zi-il* ‘theft’, (3rd sg. pres. act.) *ta-a-i-ez-zi*, *ta-i-ez-zi*, etc. ‘to steal (from)’ (< **tʰeH₄-ye/o-* [**(s)teH₂-ye/o-*]) ~ Sanskrit *tāyú-ḥ* ‘theft’, *stená-ḥ* ‘thief, robber’, *stāyát* ‘in secret’; Avestan *tāyuš* ‘thief’; Greek τητάω ‘to rob’; Old Irish *táid* ‘thief’; Old Church Slavic *tatь* ‘thief’. Note: The Sanskrit forms show so-called “movable *s*” or “mobile *s*”.

Hittite (acc. sg.) *ma-ak-la-an-ta-an* ‘thin, meager, slim (of animals)’ (< **meH₄kʰ-lo-ntʰ-* [**meH₂k̂-lo-nt-*]) ~ Greek μῆκος (Doric μᾶκος) ‘length’, μακρός ‘long, tall’; Latin *macer* ‘thin’; Old Icelandic *magr* ‘lean’; Old English *mæger* ‘lean, meager’; Old High German *magar* ‘thin, meager’ (New High German *mager*).

Hittite (1st sg. pres. act.) *ti-ya-mi* ‘to step, to go stand, to place oneself, to set in’ (< **(s)tʰ(e)H₄-ye/o-* [**(s)t(e)H₂-ye/o-*]; Cuneiform Luwian (3rd sg. pres. act.) *ta-a-i* ‘to come to stand’; Hieroglyphic Luwian (3rd sg. pres. act.) *ta-i* ‘to come to stand’ ~ Sanskrit (reduplicated) *tíṣṭhati* ‘to stand’; Greek (reduplicated) ἵστημι ‘to make to stand; to stand’, στατός ‘placed, standing’; Latin (reduplicated) *sistō* ‘to cause to stand, to set, to place’; Gothic *standan* ‘to stand’; Old Icelandic *standa* ‘to stand’; Old English *standan* ‘to stand’; Old Frisian *stonda*, *stān* ‘to stand’; Old Saxon *standan*, *stān*, *stēn* ‘to stand’; Old High German *stantan*, *stān*, *stēn* ‘to stand’ (New

High German *stehen*); Lithuanian *stóti* ‘to stand’; Old Church Slavic *stati* ‘to stand, to become’. Notes: (1) The Proto-Indo-European root contains so-called “movable *s*” or “mobile *s*”. (2) As noted by Kloekhorst (2008a:879—880):

> From the beginning of Hittite studies it has been in debate whether *tiie/a-^{zi}* goes back to the PIE root **d^{h}eh$_{1}$-* ‘to put’ or **steh$_{2}$-* ‘to stand’. The former root would be possible in view of the meaning ‘to place oneself’ and the NH merger of *tiie/a-^{zi}* with *dai-^{i}* / *ti-*, which clearly must reflect **d^{h}eh$_{1}$-*. An etymological connection with **steh$_{2}$-* would much better fit the meaning ‘to step, to go stand’, however, which cannot easily be derived from an original meaning ‘to put, to place’.

Kloekhorst reconstructs Proto-Indo-European **(s)th$_{2}$-ie/o-*.

3.4. Labialized Laryngeals

Adrados, Kloekhorst, Martinet, and Puhvel, among others, have proposed that one or more labialized laryngeals should be reconstructed for Proto-Indo-European, and, indeed, there is some evidence to support such a view. The following are taken from Bomhard (2023.3:943—947, nos. 794—798):

Proto-Indo-European **H$_{2}$^{w}el-/*H$_{2}$^{w}ol-/*H$_{2}$^{w}l̥-* ‘to draw, to pull, to tear out’: Avestan (in compounds) *varək-* ‘to draw’; Latin *vellō* ‘to pluck, to pull, to tear out’; Lithuanian *velkù*, *vilkti* ‘to drag, to pull’; Old Church Slavic *vlěkǫ*, *vlěšti* ‘to draw, to drag’; Gothic *wilwan* ‘to rob, to plunder’, *wilwa* ‘robber’. Note: There may be a connection here with the words for ‘wool’ in the sense ‘to pluck (wool)’, in which case, we can add the following: Hittite (dat.-loc. sg.) *ḫu-u-la*[*n(i)*] ‘wool’ (< **H$_{2}$^{w}(e)lH$_{1}$-n-*); Cuneiform Luwian **ḫulana/i-* ‘wool’ ~ Sanskrit *ū́rṇa-ḥ* ‘wool’; Greek λῆνος ‘wool’; Latin *lāna* ‘wool’; Welsh *gwlan* ‘wool’; Gothic *wulla* ‘wool’; Old Icelandic *ull* ‘wool’; Old English *wull* ‘wool’; Old High German *wolla* ‘wool’ (New High German *Wolle*); Russian *vólna* [волна] ‘fleece, wool’; Lithuanian *vìlna* ‘wool’. For the semantics, cf. Buck 1949:400, no. 6.22 wool: “… prob. the same as Lat. *vellere*, etc. ‘tear, pluck’.” [Cf. Bomhard 2023.3:943—944, no 794, Proto-Nostratic root **x^{w}al-/*x^{w}əl-*: (vb.) **x^{w}al-* ‘to pull (off, out), to tear (off, out)’; (n.) **x^{w}al-a* ‘the act of pulling or tearing (off, out)’.]

Proto-Indo-European **H$_{2}$^{w}et’-* [**H$_{2}$^{w}ed-*] ‘to say, to speak’: Sanskrit *vāda-ḥ* ‘speech, discourse, talk, utterance, statement’, *vádati* ‘to speak, to say, to utter, to tell, to report, to speak to, to talk with, to address’; Greek (?) ἀείδω (< **ἀ+είδω < **awe-ud-*) ‘to sing’, αὐδάω ‘to utter sounds, to speak’, αὐδή (Doric αὐδά) ‘the human voice, speech’, (?) ἀηδώ, ἀηδών ‘nightingale’; Lithuanian *vadinù*, *vadìnti* ‘to call, to name’. Note: There are no known Anatolian cognates. [Cf. Bomhard 2023.3: 945—946, no. 796, Proto-Nostratic root **x^{w}at’-* (~ **x^{w}ət’-*): (vb.) **x^{w}at’-* ‘to chatter, to speak’; (n.) **x^{w}at’-a* ‘chatter, talk’.

Proto-Indo-European *$H_2^w er\text{-}k^h$- [*$H_2^w er\text{-}k$-] ‘to cry, to squeal’: Old Church Slavic *vrěštǫ*, *vrěštati* ‘to cry, to squeal’; Czech *vřískat*, *vřeštět* ‘to cry, to whimper’; Lithuanian *verkiù*, *veřkti* ‘to weep, to cry’, *verkšnà* ‘cry-baby’, *veřksmas* ‘weeping, crying’. Note: There are no known Anatolian cognates. [Cf. Bomhard 2023.3:947, no. 798, Proto-Nostratic root *$x^w ir$- (~ *$x^w er$-): (vb.) *$x^w ir$- ‘to make a loud noise, to make a shrill sound’; (n.) *$x^w ir\text{-}a$ ‘loud noise’.]

3.5. The Phonetic Values of the Laryngeals

The literature listed at the end of this book really needs to be consulted to get an idea of how much opinions differ regarding the phonetic values of the various laryngeals. Not only that, but also on how widely different interpretations of the same data lead to positing different laryngeals at the Proto-Indo-European level. I am hoping that my own endeavors lead to clarification and not more confusion.

To begin, it might be helpful to repeat what I had previously written on the question of the phonetic values assigned to the laryngeals (cf. Bomhard 2023.1:72—79):[28]

One of the most difficult riddles to solve has been and continues to be the determination of the probable phonetic values of the various laryngeals (cf. Kessler no date). Some attempts include the following:

1. Sturtevant (1942:19), following Sapir (1938), assigns the following phonetic values to the laryngeals: *H_1 (*$\underset{\frown}{\text{ə}}_1$) = a glottal stop with frontal timbre (Sturtevant writes *’); *H_4 (*$\underset{\frown}{\text{ə}}_4$) = a glottal stop with velar timbre (Sturtevant writes *ʾ [in later works, Sturtevant writes *h]); *H_2 (*$\underset{\frown}{\text{ə}}_2$) = a voiceless velar spirant (Sturtevant writes *x); *H_3 (*$\underset{\frown}{\text{ə}}_3$) = a voiced velar spirant (Sturtevant writes *γ). See also Pulleyblank 1993:65 and 90.
2. According to Lehmann (1952:103—108), *H_1 (*$\underset{\frown}{\text{ə}}_1$) was either a weakly aspirated glottal fricative (Lehmann writes *$ʔ$) or a pharyngeal fricative; *H_4 (*$\underset{\frown}{\text{ə}}_4$) was apparently a glottal aspirated fricative (Lehmann writes *h); *H_2 (*$\underset{\frown}{\text{ə}}_2$) was a voiceless velar fricative (Lehmann writes *x); and *H_3 (*$\underset{\frown}{\text{ə}}_3$) was a rounded voiced velar fricative *[ɣ^w] (Lehmann writes *γ).
3. Keiler (1970:68) posits the following values: *H_1 (*$\underset{\frown}{\text{ə}}_1$) = a voiceless glottal fricative */h/; *H_2 (*$\underset{\frown}{\text{ə}}_2$) = a voiceless pharyngeal fricative */ħ/; and *H_3 (*$\underset{\frown}{\text{ə}}_3$) = a voiced pharyngeal fricative */ʕ/. Couvreur (1937) arrived at the same conclusion, while Pulleyblank (1993:90) proposes that a pharyngeal glide may have been at least partially involved for *H_3, which he writes /ă/.
4. Finally, Colarusso (1981:550) assigns the following values: *H_1 (*$\underset{\frown}{\text{ə}}_1$) = either a glottal stop */ʔ/ or voiceless and voiced pharyngealized velar fricatives,[29] */x^ʕ/ and */ɣ^ʕ/ (Colarusso writes */x̄/ and */ɣ̄/), respectively; *H_2 (*$\underset{\frown}{\text{ə}}_2$) = voiceless and voiced

[28] This is modified (enhanced, reformatted, and updated) from the original.

[29] Colarusso calls them “pharyngealized uvulars” and compares them to similar sounds in Semitic, where he states that they are “actually pharyngealized velars underlyingly”, and he writes them in the chart on page 550 as pharyngealized velars (*/x̄/ and */ɣ̄/). Consequently, I have labeled them “voiceless and voiced pharyngealized velar fricatives”.

pharyngeal fricatives, */ħ/ (Colarusso writes */ḥ/) and */ʕ/, respectively; *H_3 (*$\underset{\wedge}{e}_3$) = either labialized voiceless and voiced pharyngeal fricatives, */ħ^w/ (Colarusso writes */ḥ^w/) and */ʕ^w/, respectively, or a labialized glottal stop */ʔ^w/; and *H_4 (*$\underset{\wedge}{e}_4$) = a voiceless glottal fricative */h/.

According to Colarusso (1981:512), Couvreur (1937:264), Fortson (2010:64), Messing (1947:223—225), Sturtevant (1942:19 and 1951:54), Kloekhorst (2008a:62), Pulleyblank (1993:65 and 87—90), and Pooth (2015:11), *H_1 (*$\underset{\wedge}{e}_1$) was a glottal stop */ʔ/. The interpretation of *H_1 (*$\underset{\wedge}{e}_1$) as a glottal stop explains why this laryngeal did not color contiguous vowels. As noted by Catford (1977:105): "simple glottal stop has no influence on the quality of contiguous vowels". This is verifiable from both Northwest Caucasian and Arabic, where glottal stops have no effect on vowel quality (cf. Colarusso 1981:511 for Northwest Caucasian and Al-Ani 1970:60—62 for Arabic). Moreover, loss of a glottal stop between an immediately preceding short vowel and an immediately following non-syllabic causes compensatory lengthening of the vowel in Akkadian and Arabic (cf. Cantineau 1960:79; Couvreur 1937:288—289; Moscati [ed.] 1964:61—64; J. Watson 2002:18—19). Note the following examples from Akkadian (these examples are taken from Couvreur 1937:288—289):

1. Akkadian *$ra^ʔšu$ > *rāšu* (later *rēšu*) 'head'; Hebrew *$rō^ʔš$* [רֹאשׁ] 'head'; Aramaic *rēšā* 'head'; Phoenician *$r^ʔš$* 'head'; Arabic *$ra^ʔs$* 'head'; Epigraphic South Arabian *$r^ʔs$* 'head'; Śḥeri / Jibbāli *réš*/*réš* 'head'; Soqoṭri *riy* 'head'; Ugaritic *rỉs* 'head'; Geez / Ethiopic *$rə^ʔəs$* 'head' [ርእስ]; Tigrinya *$rə^ʔsi$* 'head'; Tigre *$rä^ʔas$* 'head'; Amharic *ras* 'head'. Cf. Militarëv 2011:75, no. 38.
2. Akkadian *raḥmu > *reḥmu > *$re^ʔmu$ > *rēmu* 'grace, mercy'; Hebrew *raḥūm* [רַחוּם] 'compassionate'; Arabic *raḥima* 'to have mercy, compassion', *raḥma* 'pity, compassion'; Śḥeri / Jibbāli *raḥám* 'to be kind'; Mehri *rəḥām* 'to be kind to someone'; Ḥarsūsi *reḥam* 'to pity'; Ugaritic *rḥm* 'to be kind'; Tigre *räḥama* 'to have pity on' (Arabic loan).
3. Akkadian *$ba^ʕlu$ > *$be^ʕlu$ > *$be^ʔlu$ > *bēlu* 'owner, lord'; Hebrew *$ba^ʕal$* [בַּעַל] 'lord, owner'; Ugaritic *$b^ʕl$* 'owner of the house'; Arabic *$ba^ʕl$* 'husband, master, owner'; Epigraphic South Arabian *$b^ʕl$* 'master, owner'; Ḥarsūsi *bāl* 'master, lord'; Mehri *bāl* 'owner, possessor'; Śḥeri / Jibbāli *$bá^ʕal$* 'person owning'; Soqoṭri *$ba^ʕl$* 'master, lord'; Geez / Ethiopic *$ba^ʕāl$* [በዓል] 'owner, master'; Tigre *$bä^ʕal$* 'master'; Tigrinya *$bä^ʕal$*, *$ba^ʕal$* 'master'; Amharic *bal* 'master'.

Identical developments are assumed for *H_1 (*$\underset{\wedge}{e}_1$) in Proto-Indo-European. This laryngeal is not directly attested in any of the Indo-European daughter languages, including Hittite and the other Anatolian daughter languages (cf. Bomhard 1976:230; Sturtevant 1942:53 and 1951:154).

Additional confirmation that *H_1 (*$\underset{\wedge}{e}_1$) was a glottal stop is provided by the following forms (discussed above): Sanskrit (3rd sg.) *píbati* 'drinks', Latin *bibit* 'drinks', Old Irish *ibid* 'drinks'. The Proto-Indo-European antecedent would have been the reduplicated verbal form (3rd sg. pres.) *p^hi-p^hH_1-et^hi [*pi-pH₁-eti*] 'drinks', that is, *p^hi-$p^hʔ$-et^hi. Now, according to Gamkrelidze, Hopper, and Ivanov, glottalized stops become voiced stops in

Sanskrit, Latin, and Old Irish. Likewise, we would expect the cluster *-p^hʔ- to become /b/ in these languages, and this is exactly what we do in fact find. The following developments may be assumed (cf. Gamkrelidze—Ivanov 1995.I:856): *p^hi-p^hʔ-et^hi > (with deaspiration of *-p^h- in the cluster *-p^hʔ-) *p^hi-pʔ-et^hi > (with reanalysis of *-pʔ- as *-p'-) *p^hi-p'-et^hi > (with deglottalization) *p^hi-p-et^hi > (with voicing of medial *p) *p^hi-b-et^hi > (with deaspiration of voiceless aspirates) *pi-b-eti > Sanskrit *píbati* 'drinks', Latin *bibit* 'drinks', Old Irish *ibid* 'drinks'.

Kuryłowicz (1935:29—30) sets up *H_4 (*$\underset{\frown}{ə}_4$) to account for those cases in which an *a* in the non-Anatolian daughter languages corresponds to an *a* in Hittite, and Hittite lacks a contiguous laryngeal reflex. That is to say that *H_4 (*$\underset{\frown}{ə}_4$) is not directly attested in Hittite or in any of the other daughter languages (cf. Bomhard 1976:230; Sturtevant 1942:42 and 1951:51—52), though its former presence can be determined by the fact that it changed a contiguous *e to *a and by the fact that it caused compensatory vowel lengthening when lost between an immediately preceding short vowel and an immediately following non-syllabic. According to Hopper (1977a:49—50), typological evidence implies that the voiceless laryngeal fricative /h/ should be added to the Proto-Indo-European phonemic inventory, and this coincides with the phonetic value assigned to *H_4 (*$\underset{\frown}{ə}_4$) by Colarusso (1981:512), Lehmann (1952:108), and (apparently) Sturtevant (1951:52). In terms of distinctive feature theory, /h/ is [+cons, +low, -voice, +cont, +grave]. As far as we are concerned, the most important feature is [low]. According to Chomsky—Halle (1968:305), the articulatory gesture behind the feature [low] is a "lowering [of] the body of the tongue below the level it occupies in the neutral position", while Colarusso (1981:509) defines it as "an opening of the oral cavity to enhance resonance". It was the presence of this feature that was responsible for the lowering of a contiguous *e to *a. Finally, we may note that developments similar to those assumed for *H_4 (*$\underset{\frown}{ə}_4$) in Proto-Indo-European are found in Ubykh and in the Circassian languages, where /h/ (and /h^w/) lowers and colors contiguous vowels and also causes compensatory vowel lengthening when lost (cf. Colarusso 1975: 396).

Reflexes of *H_2 (*$\underset{\frown}{ə}_2$) are found in Hittite and the other older Anatolian languages (that is, Palaic and Cuneiform and Hieroglyphic Luwian), where they are written (ḫ)ḫ (cf. Fortson 2010:178; Sturtevant 1942:35 and 1951:47). This laryngeal also survives in Lycian, where it is written *χ*. Like *H_4 (*$\underset{\frown}{ə}_4$), *H_2 (*$\underset{\frown}{ə}_2$) lowers a contiguous *e to *a. On this basis, we would expect *H_2 (*$\underset{\frown}{ə}_2$) also to be characterized by the presence of the feature [low]. A good candidate to assign as the phonetic values of *H_2 (*$\underset{\frown}{ə}_2$) would be the voiceless multiply-articulated pharyngeal/laryngeal /$\underset{\smile}{ħ}$h/ (it could also have been an adytal [+CP, +low]). Not only is this sound marked by the presence of the feature [low], which accounts for the lowering of adjacent vowels, but it also makes it easy to account for the fact that *H_2 (*$\underset{\frown}{ə}_2$) appears as *h* in Armenian before full-grade vowels. We can envision a change of *$\underset{\smile}{ħ}$ḫ into *h similar to what is found in the Ashkharwa dialect of Abkhaz (cf. Colarusso 1981:516). The resulting *h would have subsequently been lost in all of the non-Anatolian daughter languages except Pre-Armenian. As in Ashkharwa, we may venture a guess that *$\underset{\smile}{ħ}$ḫ developed from the earlier pharyngeal *ħ in Pre-Indo-Anatolian. Indeed, support for such an assumption comes from the lexical parallels between Proto-Indo-European and Proto-Afrasian, where Proto-Indo-European *H_2 (*$\underset{\frown}{ə}_2$) corresponds to Proto-Afrasian *ħ.

Finally, we should take note of Jakobson's (1971[1956]:518—520) description of similar sounds in Arabic (see also J. Watson 2002:44—45):

> … /ḥ/ is essentially a pharyngealized laryngeal. Of the two phonemes of this type, /ḥ/ is usually produced without voice and /ʿ/ with voice. Since a considerable part of the air used with /ʿ/ is consumed by voicing alone, this phoneme is a lenis, in contradistinction to the fortis /ḥ/. Thanks to the pharyngeal contraction, the voice-pitch in /ʿ/ and the whisper-pitch in /ḥ/ are very low: "In passing to /ʿ/ from a preceding vowel the voice has to descend rapidly, often through more than an octave, and is cut off at its lowest pitch. If a vowel *follows*, the pitch begins at its lowest level and rises quickly, through a similar interval, to normal vowel pitch." (1971[1956]:518—519)
>
> As to the influence upon the adjacent vowels, the componential analysis of a phoneme cannot proceed from the contextual variants of neighboring phonemes: often the variation is due not to a single feature but to a combination of concurrent features. Furthermore, in many instances the pharyngeals modify adjacent vowels in the same direction as pharyngealized buccals. In colloquial Egyptian both the pharyngealized buccals and the pharyngeals appear to exert a modifying retracting influence on preceding and following a-vowels (Gairdner, p. 46f.). In the dialect of El-Hamma, Cantineau observes that the /a:/ is pronounced "entre *a* et *o* ouvert" in contact with pharyngealized dentals, while in contact with pharyngeals it is realized as "*a* moyen français", in contact with velars it oscillates between the two positions mentioned, and in other contexts it is a front vowel. In the same dialect the phoneme /u:/ is shifted towards the closed *o* in the neighborhood of pharyngealized dentals, velars, and pharyngeals (1951, p. 78f.). (1971[1956]:520)

It is more difficult to determine the phonetic value of *H_3 (*$\underset{\frown}{ǝ_3}$) than of any of the other laryngeals. Reflexes of *H_3 (*$\underset{\frown}{ǝ_3}$) are also found in the older Anatolian languages (cf. Bomhard 1976:228—230; Fortson 2010:178; Sturtevant 1942:44 and 1951:49—51). Kuryłowicz (1935:28—30) tried to show that *H_3 (*$\underset{\frown}{ǝ_3}$) changed a contiguous *e to *o, but Sturtevant (1938:104—111 and 1942:20) has argued against such an assumption. The majority of scholars are inclined to accept Kuryłowicz's interpretation. Now, several scholars (Sturtevant, Lehmann, Keiler, and others) have suggested that *H_3 (*$\underset{\frown}{ǝ_3}$) was the voiced counterpart of *H_2 (*$\underset{\frown}{ǝ_2}$). Consequently, we can speculate that *H_3 (*$\underset{\frown}{ǝ_3}$) was a voiced multiply-articulated pharyngeal/laryngeal */$\underset{\frown}{ʕɦ}$/ (as with */$\underset{\frown}{ħh}$/, it could also have been an adytal [+CP, +low]). Now, a more careful examination indicates that *H_3 and *H_2 may actually have had the same vowel-coloring effects — Pulleyblank (1993:90) arrives at the same conclusion:

> … the effect of the O laryngeal is seen to be the same as that of the A laryngeal, only earlier in taking effect.

We know from the examples given above that *H_2 lowered and colored a contiguous *e to *a, original *i to e, and original *u to *o. As in the Arabic case discussed by Jakobson above, we would expect *H_3 to have had a similar effect on these vowels in early Proto-Indo-European. That is to say that we would expect *H_3 to have lowered and colored a contiguous *e to *a, original *i to e, and original *u to *o. In fact, there is some evidence — albeit controversial — within Indo-European itself to support this, as the following

examples involving *H_2 illustrate (these are also listed above, together with additional examples):

1. Early Proto-Indo-European *H_2ink^h- > later Proto-Indo-European *H_2enk^h- ‘to reach, to come to, to arrive at’ (Pokorny 1959:316—318 reconstructs *$enek̂$-, *$nek̂$-, *$enk̂$-, *$n̥k̂$- here): Hittite (3rd sg.) *ḫi-in-ik-zi* ‘to present, to deliver, to offer, to allot’; Sanskrit *aśnóti* ‘to reach, to come to, to arrive at, to get, to obtain; to master; to offer’; Latin *nancior* ‘to get, to gain, to obtain’, *nanciscor* ‘to get, to gain, to receive, to meet’; Tocharian A *ents*-, B *eṅk*- ‘to seize, to take’. Cf. Puhvel 1984— .3:289—292; Melchert 1994a:143—144. The Hittite form directly attests *H_2ink^h-. Note: That the transition from *i to *e was already taking place as early as Hittite is shown by forms such as (nom.-acc. sg.) *ḫé-en-gur* ‘consignment, offering, oblation, gift, tribute’ beside (nom.-acc. sg.) *ḫi-in-ku-wa-ar*. The same variation occurs in (nom.-acc. sg.) *ḫé-en-kan* ‘death, doom, deadly, disease, plague’ alongside (nom.-acc. sg.) *ḫi-in-kán*.

2. Early Proto-Indo-European *H_2ul- > later Proto-Indo-European *H_2ol- ‘to destroy’ (Pokorny 1959:777 reconstructs *ol-[e]- here): Hittite (3rd sg.) *ḫu-ul-la-a-i* ‘to smite, to destroy, to defeat’; Latin *ab-oleō* ‘to destroy’; Greek ὄλλῡμι ‘to destroy’. Cf. Couvreur 1937:143—144; Cowgill 1965:146—147 and 157 (Cowgill derives the Greek form from *$Ol̥$-ne-O-mi* and considers the o to be a replacement for original α — nonetheless, Cowgill accepts the comparison with Hittite *ḫu-ul-la-a-i*). The Hittite form directly attests *H_2ul-. Note: Kloekhorst (2008b:358—360) derives the Hittite form in question from Proto-Indo-European *h_2uelh_1-: *h_2ul-né-h_1-ti*, *h_2ul-n-h_1-énti* and compares Old Irish *follnadar* ‘to rule’; Latin *valeō* ‘to be powerful’; Lithuanian *véldu* ‘to own’; Gothic *waldan* ‘to rule’; and Old Church Slavic *vladǫ* ‘to rule’. The semantics really do not match, however. Consequently, I reject this etymology. Cf. also Melchert 1994a:55—56 (*$h_{2/3}wl̥$-ne-h_1- > Hittite *ḫulle*- ‘fight’), 66, and 82. Finally, Polomé (1965:18) and Puhvel (1984— .3:368) reject this etymology.

3. Early Proto-Indo-European *H_2um- > later Proto-Indo-European *H_2om- ‘all, whole’: Hittite (nom. sg.) *ḫu-u-ma-an-za* ‘all, whole’; Latin *omnis* ‘all, every, whole’. Cf. Couvreur 1937:144—146; Kronasser 1956:41; Pedersen 1938:165. The Hittite form directly attests *H_2um-. Note: Polomé (1965:18) and Puhvel (1984— .3:380) reject this etymology — Puhvel derives Latin *omnis* from **opnis* (as does de Vaan 2008:428). Ernout—Meillet (1979:461—462) state that there is “nothing similar elsewhere” (“Aucun mot pareil ailleurs”) to Latin *omnis*. On the other hand, Walde—Hofmann (1965—1972.II:209—210) mention Oscan *úmbn*, which points to earlier **omb-nis* and not **opnis* as the source of both the Oscan form and Latin *omnis*. **omb-nis* may contain an epenthetic *b*, in which case the original form would have been **om-ni-s*. Here, *-ni-* is a suffix. Likewise, in Hittite *ḫu-u-ma-an-za*, the stem is **ḫum*-, and the *-anz(a)* is a suffix (< **-onts* or **-n̥ts*). Thus, this etymology can be revived if we consider the original form to have been *H_2um-, which later became *H_2om-, with *-*o*- from earlier *-*u*- under the influence of the preceding laryngeal. Such an explanation overcomes the objections raised against this etymology based upon the irregular correspondence of Hittite *u* and Latin *o*.

As for *H_3, there is a strong probability that the change of *i to *e under the influence of *H_3 can be observed in Hittite (nom.-acc. sg.) *še-e-ḫur*, *še-e-ḫu-ur*, *še-e-ḫu-wa-ar* 'urine', (nom. sg.) *še-e-ḫu-ga-ni-ya-u-wa-an-za* 'besmeared with urine', and (3rd sg. pret. act.) *še-e-ḫu-ri-ya-*[*a*]*t* 'to urinate' (< *seH_3-ur* < *siH_3-ur*), discussed above.

We may summarize our findings by setting up the following matrix:

	*ʔ	*h	*ħ͡h	*ʕ͡ħ
Traditional *H_1 (*$\underline{ə}_1$)	+	-	-	-
Traditional *H_4 (*$\underline{ə}_4$)	-	+	-	-
Traditional *H_2 (*$\underline{ə}_2$)	-	-	+	-
Traditional *H_3 (*$\underline{ə}_3$)	-	-	-	+
e lowered and colored to *a*	-	+	+	+
i lowered and colored to *e*	-	+	+	+
u lowered and colored to *o*	-	+	+	+
Preserved in Anatolian	-	-	+	+
Partially preserved in Armenian	-	-	+	-

That completes (and updates) what I had previously written — but there is more. It is hard to envision how *$\underline{ħh}$ (= *H_2) and *$\underline{ʕħ}$ (= *H_3) could have become *x and *$ɣ$, which are the phonetic values commonly assigned to the reflexes of these laryngeals in the older Anatolian languages by most specialists.[30] This seems to indicate that things were more complicated than previously thought. Now, my work on distant linguistic comparison indicates that, at an early stage of development, Pre-Indo-Anatolian had, at the very least, the following relevant phonemes (cf. Bomhard 2023.1:78):

		Plain	Labialized
Glottal stops:		*/ʔ/	*/ʔʷ/
Glottal fricative:		*/h/	
Velar fricatives:	voiceless:	*/x/	*/xʷ/
	voiced:	*/ɣ/	
Pharyngeal fricatives:	voiceless:	*/ħ/	*/ħʷ/
	voiced:	*/ʕ/	

These phonemes remained intact at least up to what I call the "Phonemic Stress Stage" (= Proto-Indo-Anatolian) of Proto-Indo-European (cf. Bomhard 2023.1:78).[31] Contrary to what I had assumed when I prepared my 2023 book, it now seems likely that these phonemes also remained into the "Phonemic Pitch Stage" of Proto-Indo-European, except

[30] Kümmel 2007 and Weiss 2016 argue that *H_2 and *H_3 may have been uvular fricatives, while Kümmel 2022 argues in favor of uvular stops.

[31] Recently, new terminology has been proposed to describe the various stages of development. "Indo-Anatolian" has replaced "Indo-Hittite" to describe the stage of development prior to the separation of the Anatolian branch from the main speech community. Next, "Indo-Tocharian" has been coined to describe the stage of development following the separation of Anatolian but prior to the separation of Tocharian. Finally, "Indo-European" has been retained to describe the stage following the separation of Tocharian and prior to the emergence of the remaining branches.

that */ħ/ and */ʕ/ became the multiply-articulated voiceless and voiced pharyngeal/laryngeal fricatives */ʜ͡ħ/ and */ʢ͡ɦ/, respectively. Prior to these changes, these laryngeals had no "vowel coloring" effects on contiguous vowels. After these changes, however, these sounds lowered contiguous vowels: **e* > **a*, original **i* > **e* and original **u* > **o*. This is extremely important, since I have maintained (Bomhard 2023.1:78) that the Anatolian branch became separated from the main speech community at the end of the "Phonemic Pitch Stage" of Proto-Indo-European. In Pre-Anatolian, */ʜ͡ħ/ and */x/ merged into */x/, while */ʢ͡ɦ/ and */ɣ/ merged into */ɣ/. (At the same time, */ʔ/ [= *H_1] and */h/ [= *H_4] were lost.) This accounts for the reflexes found in the older Anatolian daughter languages. Things were different, however, in the Indo-European ancestor of the non-Anatolian daughter languages. Here, */ʜ͡ħ/ and */x/ merged into */ʜ͡ħ/, while */ʢ͡ɦ/ and */ɣ/ merged into */ʢ͡ɦ/. (As a typological parallel, it may be mentioned that a similar change has taken place in Hebrew, where Proto-Semitic */ʕ/ and */ɣ/ have merged into /ʕ/ [ע], and */ħ/ and */x/ have merged into /ħ/ [ח] — the change was complete by the Middle Hebrew period [cf. Lipiński 2001:152—153].) Then, in the stage of development which I have called "Disintegrating Indo-European",[32] the laryngeals were mostly lost. First, the laryngeals */ʔ/ and */h/ were lost initially before vowels. In all other environments, */ʔ/ and */h/ merged into */h/. Then, the laryngeals */ʜ͡ħ/ and */ʢ͡ɦ/ became */h/ (*/ʜ͡ħ/ > */h/; */ʢ͡ɦ/ > */ɦ/ > */h/). At this time, the single remaining laryngeal */h/ had no vowel-coloring effects on contiguous vowels. Finally, this */h/ was lost initially before vowels (except in Pre-Armenian) and medially between an immediately preceding vowel and a following non-syllabic. This latter change caused compensatory lengthening of preceding short vowels (**eHC*, **oHC*, **aHC*, **iHC*, **uHC* > **ēC*, **ōC*, **āC*, **īC*, **ūC*). Note: */h/ may have been simply lost without a trace in certain contexts (cf. Byrd 2010).

3.6. Old Letters, New Values

Earlier in this chapter, under the discussion of Carian phonology, I mentioned that new values have been assigned to several Carian letters. Let me repeat what I said (I am referring to the table prepared by Melchert 2004e:610 and given above):

> Three of the letters in this table are of particular importance to our understanding of the development of laryngeals in Anatolian under investigation in this paper, namely, the letters transcribed by Melchert as /q/, /x/, and /k/. Adiego (2004:242—245) assigns slightly different values for two of the letters, namely, /k/ = Melchert's /x/ and /k̂/ = Melchert's /k/. Both Adiego and Melchert agree on /q/. Several scholars (Kloekhorst, Schürr, and Simon) have adopted the new values in recent work on Carian and Anatolian, in general — Brosch (no date) provides an excellent summary of the views of these scholars, while Simon (2021) lists the lexical evidence. However, Adiego's arguments in favor of the values he assigns to these letters are highly conjectural and based upon conflicting evidence. When one takes into consideration etymological factors, it can be observed that Carian /k/ (Melchert) ~ /k̂/ (Adiego) corresponds etymologically to /k/ in older Anatolian languages (Hittite, Palaic, and Cuneiform and Hieroglyphic Luwian), while /x/ (Melchert) ~ /k/ (Adiego) corresponds etymologically to /ḫ/ in older Anatolian languages. /q/, on the other hand, appears to represent /xʷ/, just as in Lycian (see footnote 17).

[32] This is the stage of development between the separation of the Anatolian branch from the main speech community and the emergence of the various non-Anatolian Indo-European daughter languages.

In my opinion, this speaks in favor of the values given by Melchert in the above table and against the values assigned by Adiego.

I want to stress that the evidence upon which the new values are based has not changed. What is new is the *interpretation*. Brosch (no date) lists the Carian vocabulary typically interpreted as containing reflexes of the laryngeals — remember that the *k* in these forms represents the Carian letter traditionally interpreted as *χ* (= Melchert's *x*):

1. The element *kδ*° 'former, first' in the name *kδ-uśolš* and the controversial *kδou-* 'king' (?), which have been compared with Lycian *χñtawat(i)-* 'ruler, sovereign' (< **h₂ent-*).
2. *p/bik*° (mostly Greek *Pig*°) 'light' in various proper names (< **bʰēh₂-*).
3. *kb-* 'river, stream' in the place names *kbid-* 'Kaunos' and *kbo-* 'Keramos' (< **h₂eb⁽ʰ⁾-o/n-*).
4. *ksbo* 'ankle' in personal names (< **h₂emsu-*+*-ā*) (cf. Lycian *χahba*).
5. Place name *kiδb-* (< *Hinduwa*).
6. The Greek gloss κόον 'sheep', perhaps also in the title *koíoλ* (< **h₃eu̯i-*) (cf. Lycian *χawã*).
7. Proper name *quq-* (Greek *Gýgēs*, *Gugos*), also in proper names *dquq* (Greek *Idagygos*) (< **h₂eu̯h₂o/eh₂-* 'grandfather') (cf. Lycian *χuge*).
8. Name of the Storm God *trq(u)δ-* (< **tr̥h₂unt-*) (cf. Lycian *Trqqñt-*).
9. *qdarŕou-* 'servant' in personal names (cf. Cuneiform Luwian *ḫutarlā-*).
10. Conjunction *=q* 'and' (< **=h₃e* or **=h₂o* or **=kʷe* ?).
11. Probably the pronoun *χiχ* (= Lycian *tike*, Milyan *kike*; Cuneiform Luwian *kuišḫa*).

Brosch mentions that there are several other items without etymologies.

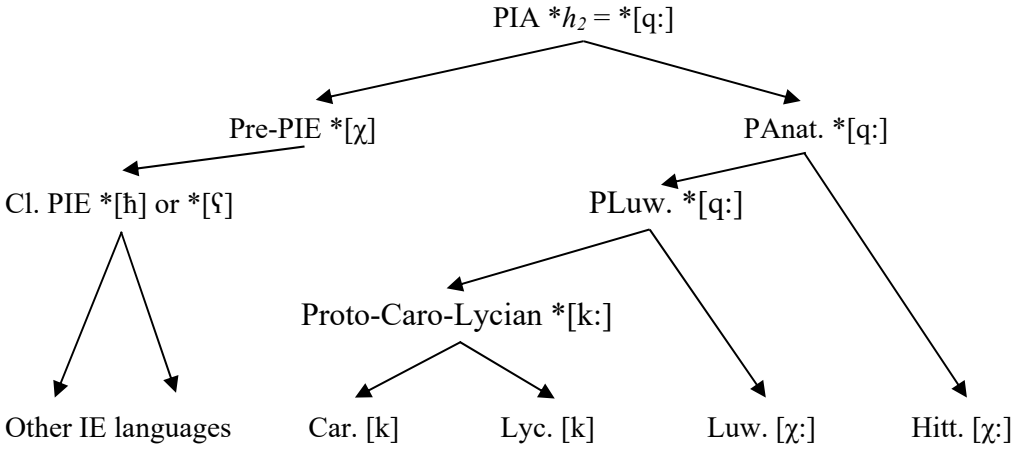
Were this all, it would not be that big an issue, given the extremely small size of the Carian corpus and the uncertainty surrounding the alleged reflexes of the laryngeals, and the debate on the values of these letters could have been confined to Carian, without too much damage. However, the new interpretation has spread to Lycian as well, and this is important. Brosch summarizes the new interpretation in the following table — he gives the names of the major scholars involved and references to the relevant publications:

Proto-Anatolian	Hittite, Palaic, Cun. Luw.	Lycian	Carian				
			Simon (2011)	Kloekhorst (2008b)	Adiego (2007)	Schürr (2001)	Adiego (1995)
**H-*	*ḫ-*	*χ* [k]	*k* [k], *q* [q]/__*u*	*k* [k]			?
**-H-*	*-ḫḫ-*	*χ* [k]	*k* [k]		*k* [k], *q* [q]	*k* [k], *q* [q]	
**-h-*	*-ḫ-*	*g* [γ]	*q* [q]	?			*k* [k]
**(-)Hʷ-*	*(-ḫ)ḫu-*	*q* [kʷ?]	*qu* [qu] < **h₂u*	*q* [kʷ]			*q* /kʷ/k]

The final step in the evolution of these ideas is the proposal that the laryngeals preserved in Anatolian (namely, **H₂* and **H₃*) were actually uvular stops in Pre-Anatolian

(cf. Kloekhorst 2018).[33] The thinking is that they would have been preserved as stops in Lycian and Carian but changed to uvular fricatives in Hittite, Palaic, and Cuneiform and Hieroglyphic Luwian. Kloekhorst (2018:79) concludes regarding *H_2*:

> We have seen that, typologically, it is difficult to understand how Lycian and Carian [k] could have been the outcome of *h_2* if the latter sound originally was a uvular fricative. Instead, Lyc./Car. [k] is much better explained from a uvular stop, which can also account for the uvular fricative as found in Hittite and Luwian. Moreover, there are additional arguments to be given in favour of such a reconstruction, especially the fact that *h_2* yields a fortis (long) consonant in Hittite and CLuwian.
>
> All in all, I want to propose the following values for *h_2* in the different language stages:



The interpretation of the laryngeals *H_2* and *H_3* as uvular stops in Pre- or Proto-Indo-Anatolian proper has major implications for the basic tenets of the Laryngeal Theory listed at the beginning of this chapter. First, there is the question of the vowel-coloring effects traditionally attributed to the laryngeals. The vowel-coloring effects must have already begun in Pre- or Proto-Indo-Anatolian, since they can clearly be observed in the Anatolian daughter languages. As noted by Colarusso (1981), plain uvular stops and fricatives cannot have produced these effects. Colarusso discusses, in detail, typological parallels with Northwest Caucasian, Northeast Caucasian, and Semitic to illustrate this point. Consequently, plain uvular stops and fricatives can be ruled out at the Proto-Indo-Anatolian level on this basis alone. Next, the plain pharyngeal fricatives reconstructed by Kloekhorst for the Proto-Indo-European precursor of the non-Anatolian daughter languages also cannot have produced the vowel-coloring effects traditionally attributed to the laryngeals — additional phonetic features and developments are required. (Here, it may be noted that the loss of pharyngeal fricatives, as well as other "laryngeals", in Akkadian resulted in the change of contiguous /a/ to /e/ [cf. Lipiński 2001:149] — this is the exact opposite of the vowel-coloring effects traditionally attributed to "*a*-coloring laryngeals" in Proto-Indo-European.) This was illustrated above in the table of Semitic developments originally prepared by Couvreur (1937:288—289) and is also discussed by Colarusso (1981) — instructive here as well are the typological parallels between the development of the

[33] Similar ideas were expressed by Kaiser—Shevoroshkin (1985), regarding Proto-Nostratic.

"laryngeals" in Coptic, on the one hand, and in Proto-Indo-European, on the other hand, discussed by Greenberg (1969:175—184). It may also be noted that the laryngeals do not pattern as stops during any period of development. Finally, my work on distant linguistic comparison (cf. Bomhard 2023) does not support these views. I have given references to that monograph throughout the present chapter. Moreover, my 2019 *Journal of Indo-European Studies* paper entitled "The Origins of Proto-Indo-European: The Caucasian Substrate Hypothesis",[34] in which I present evidence of prehistoric language contact between the precursors of Proto-Indo-European and Proto-Northwest Caucasian, does not support these views. In sum, these theories simply are not supported by the cumulative evidence.

It seems to me that the initial mistake began with the interpretation of the Carian reflexes of the laryngeals preserved in Anatolian as stops. This simply cannot be correct. Likewise, the interpretation of the Lycian reflexes of these laryngeals as stops cannot be correct. Consequently, I urge that these theories be abandoned and that the earlier values assigned to the letters in question in Carian and Lycian be reinstated.

[34] This paper was substantially expanded and reissued in book format under a Creative Commons license in 2023 under the title *Prehistoric Language Contact on the Steppes: The Case of Indo-European and Northwest Caucasian*.

Chapter 4
The Reconstruction of the Proto-Anatolian Consonant System

4.1. Introduction

Before the discovery of Hittite and the other Anatolian Indo-European daughter languages, the consonant system of Sanskrit, with its four-way contrast of (1) plain voiceless ~ (2) voiceless aspirated ~ (3) plain voiced ~ (4) voiced aspirated stops and affricates, was thought to preserve the consonant system of the Indo-European parent language better than any of the other older Indo-European daughter languages:

	(1)	(2)	(3)	(4)
Velar	k	kh	g	gh
Palatal (affricates)	c	ch	j	jh
Retroflex	ṭ	ṭh	ḍ	ḍh
Dental	t	th	d	dh
Bilabial	p	ph	b	bh

Indeed, the prestige of Sanskrit is such that it has served as the model for the reconstruction of the Proto-Indo-European consonant system from the time of Schleicher to the present day. Most of the current handbooks/comparative grammars reconstruct a modified version of the Sanskrit consonant system for Proto-Indo-European, eliminating, notably, the voiceless aspirates (column 2 above) as well as the palatal and retroflex sounds of Sanskrit, while adding labiovelars, thus (cf. Adrados 1975.I:108; Beekes 2011:119—120 [traditional transcription]; Byrd 2018:2056—2079, table pp. 2056—2057; Cowgill—Mayrhofer 1986:91—118; Clackson 2007:34; Fortson 2010:56; Fulk 2018:99; Lehmann 1952:7—8; Mallory—Adams 1997:459 and 2006:55; Meier—Brügger 2003:96—139, table p. 126, and 2010:226—270, table p. 257; Meillet 1964:82—98; Shevelov 1964:25—26; Sihler 1995:135; Watkins 1998:34; Wodtko—Irslinger—Schneider 2008):

	Labial	Dental	Palatal	Velar	Labiovelar
Voiceless	*p	*t	*k̂	*k	*k^{w}
Voiced	(*b)	*d	*ĝ	*g	*g^{w}
Voiced aspirated	*bh	*dh	*ĝh	*gh	*g^{w}h

Note: Each author uses a slightly different transcription, especially for the palatals.

There are well-known and often-mentioned problems with this reconstruction (cf. Mallory—Adams 2006:50—53), especially the typological implausibility of such a system. Since I have discussed these problems in a previous paper (Bomhard 2016), I will not go into details here. Suffice it to say that the traditional reconstruction of the Proto-

Indo-European system of stops, as represented above, is in desperate need of a major overhaul.

One of the most important axioms of the comparative method is that the oldest attested (and highest quality) data should play a pivotal role in the reconstruction of proto-languages. In the case of Indo-European, the oldest attested data come from the Anatolian branch, the consensus now being that this branch was the first to split off from the rest of the Indo-European speech community (cf. Jasanoff 2017:233—234). As it happens, the Anatolian branch contains several archaic features in the phonological systems of its member languages (namely, Hittite, Palaic, Cuneiform and Hieroglyphic Luwian, Lycian, Lydian, and several other poorly-attested languages), such as the preservation of laryngeals, not found in any of the other Indo-European daughter languages (cf. Jasanoff 2017:221—225) — a trace of an earlier laryngeal most likely exists in Armenian (cf. Winter 1965), while Kümmel (2018) tries to show that laryngeals may have been preserved in Iranian as well. In my opinion, the significance of the Anatolian phonological data, except for the laryngeals, has not been fully appreciated.

From the very start, it must be made clear that there are still many unresolved questions regarding Hittite/Anatolian phonology. First, there is often disagreement among specialists concerning the interpretation of different writing conventions (cf. Jäntti 2017), though it is now generally accepted that "Sturtevant's Law" (see Chapter 2 for details), that is, medial double writing versus medial single writing of stops, represents a genuine phonemic distinction in Hittite (cf. Kimball 1999:90—95), either a voicing contrast or a fortis ~ lenis contrast or even something else altogether — Kloekhorst (2016:213—217) and Jäntti (2017), for example, consider the distinction between medial single writing versus medial double writing of stops in Hittite to be one of length, while Melchert (1994) and Yates (2019a) maintain that medial double writing indicates simple gemination of earlier voiceless obstruents. Specifically, Yates (2019a) maintains that:

> … Sturtevant's Law was a conditioned pre-Hittite sound change whereby (i) contrastively voiceless word-medial obstruents regularly underwent gemination (cf. Melchert 1994), but gemination was blocked for stops in pre-stop position; and (ii) the inherited [±voice] contrast was then lost, replaced by the [±long] opposition observed in Hittite (cf. Blevins 2004). I provide empirical and typological support for this novel restriction, which is shown not only to account straight-forwardly for data that is problematic under previous analyses, but also to be phonetically motivated, a natural consequence of the poorly cued durational contrast between voiceless and voiced stops in pre-stop environments. I develop an optimality-theoretic analysis of this gemination pattern in pre-Hittite, and discuss how this grammar gave rise to synchronic Hittite via "transphonologization" (Hyman 1976, 2013). Finally, it is argued that this analysis supports deriving the Hittite stop system from the Proto-Indo-European system as traditionally reconstructed with an opposition between voiceless, voiced, and breathy voiced stops (contra Kloekhorst 2016, Jäntti 2017).

Though the recent paper by Simon (2019) is directed specifically against the views of Kloekhorst and Jäntti, his conclusions apply equally to the views advanced by Yates. It is thus worth quoting Simon's concluding remarks in full:

> Kloekhorst's arguments against the traditional voiced/voiceless contrast in Anatolian stops is not probative. None of his arguments necessarily require a contrast in length. Moreover,

transcriptions and loanwords from half a dozen languages equivocally and unambiguously show that Hittite and Luwian stops were always perceived as voiceless and voiced stops and never as geminates, *pace* Melchert and Kloekhorst. One cannot reject this evidence since the perception was consistent across many languages and many centuries (almost one millennium) involving both Hittite and Luwian. In other words, there is no reason to assume that the contrast in Anatolian stops was in length; and consequently the contrast in voice is neither a shared innovation nor a defining feature of the non-Anatolian Indo-European languages.

Next, there is still no consensus on the significance of plene writing of vowels (cf. Makarova 2001). These unresolved questions notwithstanding, the Anatolian data can still tell us a great deal about the phonological system of their immediate Proto-Indo-Anatolian ancestor. As we shall see, it is nothing at all like the Sanskrit-based reconstruction mentioned above.

4.2. Stops

It is clear that Proto-Anatolian had a voicing contrast in stops in all positions, initial, medial, and final (cf. Kimball 2017:252—253; Melchert 2017:177; Luraghi 1998:175), though this may have developed into a fortis ~ lenis contrast independently in the various Anatolian daughter languages. From the point of view of the Proto-Indo-Anatolian ancestor of Proto-Anatolian, it is the preservation of a voicing contrast that is of paramount importance and not the inner-Anatolian developments. Thus, at a minimum, the following stops can be confidently reconstructed for Proto-Anatolian:

	Voiceless	Voiced
Bilabial	p	b
Dental	t	d
Velar	k	g
Labiovelar	k^w	g^w

Now, it should be noted that there is absolutely no evidence whatsoever from any of the Anatolian daughter languages that a series of voiced aspirates existed in Proto-Anatolian (cf. Kimball 2017:252). This is an important point. It implies that the voiced aspirates traditionally reconstructed for Proto-Indo-European must have developed after the separation of the Anatolian branch from the main speech community. In fact, the voiced aspirates are only really needed to account for developments in Indo-Aryan (but not Iranian), Greek, Armenian, and Italic.

As noted above, the traditional reconstruction of the Proto-Indo-European stop system posits a three-way contrast of (1) plain voiceless stops, (2) plain voiced stops, and (3) voiced aspirated stops. While the voiceless stops posited for Proto-Anatolian above unambiguously correspond to the plain voiceless stops (*p, *t, *ḱ, *k, *k^w) of traditional Proto-Indo-European, the voiced stops posited for Proto-Anatolian above are usually taken to correspond to both the plain voiced stops (*b, *d, *ǵ, *g, *g^w) and the voiced aspirated stops (*b^h, *d^h, *$ǵ^h$, *g^h, *g^{wh}) of traditional Proto-Indo-European. This is interpreted to mean that the plain voiced stops and voiced aspirates of traditional Proto-Indo-European

have merged into a single series of plain voiced stops in Proto-Anatolian (cf., for example, Kloekhorst 2008a:17). Though on the surface, this appears to account quite nicely for the Anatolian developments, there are indications from within Anatolian itself that a three-way contrast must be reconstructed in the system of stops for Proto-Anatolian instead of a simple two-way contrast. The evidence, though sparse, comes mainly from Luwian and, to a lesser extent, Hittite.

In Luwian, traditional Proto-Indo-European **k* was preserved before high front vowels, as in the following example:

> Cuneiform Luwian *kiš-* 'to comb, to card' = Hittite (3rd sg. pres. act.) *ki-iš-zi* 'to comb' < Proto-Anatolian **kes-* 'to comb, to card' < traditional Pre-Anatolian Proto-Indo-European **kes-* 'to comb, to card'. Probable non-Anatolian cognates include Greek κέσκεον (< **kes-kes-*) 'tow, oakum'; Old Church Slavic *češǫ*, *česati* 'to comb, to pull off'.

On the other hand, traditional Proto-Indo-European **ĝh* was lost in the same environment in Luwian, as shown by the following examples:

1. Cuneiform Luwian (nom. sg.) *(i-)iš-ša-ri-iš*, *i-iš-ri-iš*, etc. 'hand'; Hieroglyphic Luwian (acc. sg.) *i-sà-tara/i-na* 'hand'; Lycian *izri-* 'hand' (all with loss of an earlier initial voiced velar before high front vowel) = Hittite (nom.-acc. sg.) *ki-eš-šar* 'hand' < Proto-Anatolian **gēsar* 'hand' < traditional Pre-Anatolian Proto-Indo-European **ĝhēsr̥* 'hand'. Non-Anatolian cognates (from the same root but with a different suffix) include the following: Sanskrit *hásta-ḥ* 'hand'; Old Persian *dasta-* 'hand'; Avestan *zasta-* 'hand'; Latin *praestō* (< **prae-hestōd*) 'at hand, ready'. Note: The Hieroglyphic Luwian form contains an epenthetic *t*.

2. Cuneiform Luwian (gen. sg.) *im-ma-ra-aš-ša* 'open country' = Hittite (nom. sg.) *gi-im-ra-aš* 'the outdoors, countryside, field; military campaign' < Proto-Anatolian **gim-ra-* 'open country, countryside, field' < traditional Pre-Anatolian Proto-Indo-European **ĝhim-ro-* 'open country, countryside' (< 'the wintry steppe, the inhospitable outdoors' [cf. Kloekhorst 2008:476—477; but see Garnier 2018 for a different interpretation]). Non-Anatolian cognates include Greek χειμερινός 'of or in winter; stormy'; Armenian *jmeṙn* 'winter, snow-storm'.

Now, what about traditional **ĝ*. Curiously, it appears to have been preserved before high front vowels in Luwian, provided, of course, that the following is a valid etymology:

> Cuneiform Luwian ([adj.] gen.) *ki-in-za-al-pa-aš-ši-iš* 'kind, gentle (?)' = Hittite (2nd sg. present act.) *ge-en-zu-wa-i-ši* 'to treat gently, to be compassionate (towards), to be kind', ([adj.] nom. sg.) *ge-en-zu-wa-la-aš*, *gi-in-zu-wa-la-aš* 'kindhearted, gentle' < Proto-Anatolian **gen-s-* 'to treat gently, to be kind' < traditional Pre-Anatolian Proto-Indo-European **ĝenH₁-(s-)* 'to treat gently, to be kind'. Non-Anatolian cognates include Latin *gentīlis* 'belonging to one's family, clan, tribe, or nationality' (> Modern English *gentle* in the sense 'considerate or kindly in disposition; amiable and tender');

Old English *gecynd* ‘nature, quality, character; race, species; origin, generation, birth’, *gecynde* ‘natural, native, innate; proper, fitting, lawful’, *gecyndelic* ‘kindly; natural, innate; proper’. Note: The meaning of the Cuneiform Luwian form is uncertain. The interpretation given here is that of the author, based upon the putative Hittite cognate.

Thus, we can clearly see that the three series have different treatments before high front vowels in Luwian. Traditional Pre-Anatolian Proto-Indo-European **k* and **ĝ* were preserved, while **ĝh* was lost. If, as is often claimed, the traditional Pre-Anatolian Proto-Indo-European plain voiced stops and voiced aspirates had merged in Proto-Anatolian, we would expect **ĝ* to have been lost before high front vowels in Luwian as well, which does not appear to be the case.

More evidence is to be found in the treatment of dentals initially before high front vowels and *y* in Hittite. In this case, the voiceless dental stop (**t*) of traditional Proto-Indo-European became an affricate *z* (= /t͡s/) in Hittite (cf. Sturtevant 1951:60—61; Melchert 1994:117; Kimball 1999:287—288), while the voiced aspirated dental stop (**dh*) of traditional Proto-Indo-European was preserved (cf. Kimball 1999:292), as in (3 sg. pres. act. ?) *ti-it-ta-i* ‘to install, to assign’ < **dhi-dhH₁-oi-ei* (cf. Kloekhorst 2008:881—882 — other reconstructions are possible). The traditional plain voiced dental stop (**d*), on the other hand, became *š* in Hittite (cf. Kimball 1999:291—292) (but not in Cuneiform and Hieroglyphic Luwian or Palaic), as shown in the following example:

Hittite (nom. sg.) *ši-i-wa-az* ‘day’ and (gen. sg.) *ši-(i-)ú-na-aš* ‘god’ = Palaic (nom. sg.) *Ti-ya-az(-)* name of the sun-god, (nom. sg.) *ti-ú-na-aš* ‘god’; Hieroglyphic Luwian *Tiwat-* name of the sun-god, (adj.) *tiwatami-* ‘bright, sunny’; Cuneiform Luwian (nom. sg.) *Ti-wa-az* name of the sun-god < Proto-Anatolian **tyēwat-* < Pre-Anatolian Proto-Indo-European **dyēw-* (cf. Benveniste 1962:8; Kloekhorst 2008:763—764). Non-Anatolian cognates include: Sanskrit *dyáu-ḥ* ‘heaven, sky, day’, *devá-ḥ* ‘god’; Greek Ζεύς ‘Zeus’, δῖος ‘god-like, divine’; Armenian *tiv* ‘day’; Latin *diēs* ‘day’, *deus* ‘god’; etc.

Here once again, had the traditional Pre-Anatolian Proto-Indo-European plain voiced stops and voiced aspirates merged in Proto-Anatolian, we would expect **d* and **dh* to have the same treatment before high front vowels and *y* in Hittite, which is not the case.

Though the cumulative evidence from the Anatolian daughter languages, such as it is, points to three series of stops in Proto-Anatolian instead of two, we run into a potential problem, if, as stated above, there is no evidence for earlier voiced aspirated stops in either Proto-Anatolian or Pre-Anatolian Proto-Indo-European. It is wrong, lacking corroborating evidence, to project the Sanskrit-based reconstruction of the Proto-Indo-European consonant system back in time to Pre-Anatolian Proto-Indo-European. In other words, the Anatolian evidence should be taken at face-value. Consequently, given that Pre-Anatolian Proto-Indo-European most likely did not have voiced aspirated stops as part of its consonant inventory, then a solution to this problem is really not possible within the context of the traditional reconstruction of the Proto-Indo-European consonant system. However, a viable solution was proposed in three articles by Gamkrelidze. Essentially, based upon a

careful examination and analysis of Hittite scribal conventions, Gamkrelidze proposed a radical new interpretation of Sturtevant's Law. This new interpretation has major implications not only for Proto-Anatolian but also for Pre-Anatolian Proto-Indo-European.

In the first article, Gamkrelidze (1968:91—92) maintains that Hittite was written in a cuneiform syllabary derived from a form of Old Akkadian cuneiform in use in Northern Syria in the beginning of the second millennium BCE. Now, the older cuneiform writing system, which was developed by the Sumerians, was not suited to rendering Akkadian, much less Hittite. In Old Akkadian, voiceless, voiced, and emphatic consonants were not differentiated in the writing system, though methods were gradually developed to represent most of the Akkadian phonological distinctions. This is important, for no attempt was ever made, even after Akkadian had introduced separate syllabograms to differentiate voiceless, voiced, and emphatic consonants, to modify the Hittite writing practices to make use of the same methods to note a voicing contrast in stops (cf. Melchert 2017:177; Kloekhorst 2008:21 and 2016:214—215). We must conclude, therefore, that the Hittite scribes did not feel that it was worthy of noting such a contrast, regardless of what the underlying phonetics may have been.

What then, if anything, does medial double writing of stops indicate if not a voicing contrast? According to Gamkrelidze (1968:94), medial double writing of stops in Hittite was used as a means to indicate the presence of aspiration (Patri 2009 and 2019 reaches the same conclusion). In the two subsequent articles (1982 and 2008), Gamkrelidze elaborates further on this proposal.

But, there is more. There are several troubling exceptions to Sturtevant's Law in which words exhibiting medial double writing of stops in Hittite correspond etymologically to words in other Indo-European daughter languages with medial voiced stops. These alleged exceptions can best be explained as geminates (cf. Bomhard 2000 for discussion and examples).

Taking into consideration Gamkrelidze's findings as well as the apparent exceptions, Sturtevant's Law is to be reinterpreted as follows: double writing of medial stops indicates stop plus something additional, that is, either aspiration or gemination, while single writing of medial stops indicates a plain stop pure and simple. It does not indicate either a voicing contrast or a fortis ~ lenis contrast as traditionally assumed.

There is another, very important implication of Gamkrelidze's theories. As stated at the beginning of this section, "there is absolutely no evidence whatsoever from any of the Anatolian daughter languages that a series of voiced aspirates existed in Proto-Anatolian". Since it was clearly the feature of aspiration that was important to the Hittite scribes, this means that, had there been a series of voiced aspirates in Hittite, we would expect that they, too, would have been written double medially. However, this is not the case. The sounds in question (series 3 below) are consistently written single medially — no aspiration, no double writing; hence, no voiced aspirates.

Given that three series of stops must be reconstructed for Proto-Anatolian, we can now add a third series to its consonant inventory on the basis of the new interpretation of Sturtevant's Law by Gamkrelidze, namely, voiceless aspirates, thus:

	(1) Voiceless Aspirated	(2) Plain Voiceless	(3) Plain Voiced
Bilabial	p^h	p	b
Dental	t^h	t	d
Velar	k^h	k	g
Labiovelar	k^{wh}	k^w	g^w

The voiceless aspirated stops (column 1) correspond to the plain voiceless stops (*p, *t, *$\hat{k}$, *k, *k^w) of traditional Proto-Indo-European, while the plain voiceless stops (column 2) correspond to the plain voiced stops (*b, *d, *$\hat{g}$, *g, *g^w), and the plain voiced stops (column 3) correspond to the voiced aspirated stops (*b^h, *d^h, *$\hat{g}^h$, *g^h, *g^{wh}).

On the surface, it would appear that a sound-shift similar to what is assumed to have taken place in early Proto-Germanic — so-called "Grimm's Law" (cf. Fulk 2018:102—105) — is to be set up to account for the development of the above Proto-Anatolian consonant system from traditional Proto-Indo-European. But is this really warranted? No — not if the glottalic model of Proto-Indo-European consonantism (on which, see Bomhard 2016 and 2023.1:57—67; Gamkrelidze 1987 and 2003; Gamkrelidze—Ivanov 1972, 1973, and 1995.I:5—16; Hopper 1973, 1977a, 1977b, 1981, and 1982; Salmons 1993) is taken as the starting point. Then, all that is needed is the deglottalization of the glottalics to arrive at the Proto-Anatolian consonant system proposed above (so also Kloekhorst 2008a:25, but see below). Such a change would eliminate the need to assume a sound-shift. Thus, under the glottalic model of Proto-Indo-European consonantism (specifically, as formulated by Bomhard 2016), the voiceless aspirated stops (column 1) correspond to voiceless aspirated stops (*p^h, *t^h, *$\hat{k}^h$, *k^h, *k^{wh}) in the glottalic model, while the plain voiceless stops (column 2) correspond to glottalized stops (*p', *t', *$\hat{k}$', *k', *k^{w}'), and the plain voiced stops (column 3) correspond to plain voiced stops (*b, *d, *$\hat{g}$, *g, *g^w). Viewed in this light, the Proto-Anatolian stop system reconstructed above provides strong support for the glottalic model of Proto-Indo-European consonantism as opposed to the traditional reconstruction. Furthermore, it eliminates the need to posit a series of voiced aspirates in its immediate Proto-Indo-Anatolian ancestor. Finally, it should be noted that this new interpretation is completely natural from a typological perspective, thus overcoming the problem of the typological implausibility of the traditional reconstruction of the Proto-Indo-European stop system.

At this point, it is necessary to discuss a new theory proposed by Kloekhorst, which affects the reconstruction of series 2 above. In an unpublished paper (2014c), Kloekhorst argues that Luwian provides evidence for the preservation of glottalization, explicitly, pre-glottalization, in series 2 above. He presents more evidence in his 2016 article (Kloekhorst 2016:226—228), concluding:

> All in all, my reconstruction of the pre-Proto-Anatolian stop system is one of three series, namely one of voiceless long stops, one of pre-glottalized voiceless short stops, and one of plain voiceless short stops, corresponding to the PIE stops in the way shown in Tab. 2 (exemplified by the row of dental stops).

Thus, for Pre-Proto-Anatolian, Kloekhorst reconstructs */t:/, */ˀt/, */t/ (= traditional Proto-Indo-European *t, *d, *dh, respectively), using the dentals for illustration (however, Simon 2019 presents compelling evidence against Kloekhorst's interpretation — see above for details).

Now, the cumulative evidence from all of the Indo-European daughter languages seems to indicate that the glottalized stops (that is, *p', *t', *k̂', *k', *k'^{w}) were originally post-glottalized in all positions in Proto-Indo-European, including Pre-Anatolian Proto-Indo-European. In my 2016 paper entitled "The Glottalic Model of Proto-Indo-European Consonantism: Re-igniting the Dialog", I proposed that there may have been dialectal variation in the timing of glottalization in the glottalic series before their ultimate loss, and I cited the example of the American Indian language Sm̓algyax (also called Coast Tsimshian) spoken in northwestern British Columbia and southeastern Alaska as a possible typological parallel (Bomhard 2016:387). The following rules for the timing of glottalization may tentatively be postulated for at least some dialects of Proto-Indo-European:

1. If a glottalized segment occurs before a vowel, it is post-glottalized: /Ċ/ → [Cˀ]/__V.
2. If a glottalized segment occurs after a vowel, it is pre-glottalized: /Ċ/ → [ˀC]/V__.
3. If a glottalized segment occurs word final before pause, it is deglottalized and unreleased: /Ċ/ → [C˺]/__#.
4. If a glottalized segment occurs between vowels, it is post-glottalized if the accent falls on the second vowel: /Ċ/ → [Cˀ]/V__V́.
5. If a glottalized segment occurs between vowels, it is pre-glottalized if the accent falls on the first vowel: /Ċ/ → [ˀC]/V́__V.

Notes:
1. Ċ = any glottalic (/p'/, /t'/, /k'/, /k'^{w}/).
2. Rule no. 2 would account for Winter's Law in Balto-Slavic.
3. Rule no. 2 would account for the "vestjysk stød" in the western dialects of Danish and preaspiration in West Scandinavian, if these are not recent developments, as some have maintained.
4. Kloekhorst has recently (2016:226—228) proposed that the glottalics became pre-glottalized in Proto-Anatolian and that the glottalization was eventually lost: *t', *k', *k'^{w} → *'t, *'k, *'k^{w} → *t, *k, *k^{w}. The above rules would account for Kloekhorst's views.

Setting up the above rules would account for Kloekhorst's views on pre-glottalization. It should also be noted that such a scenario is hinted at by Salmons (1993:24) but not elaborated upon.

Thus, incorporating Kloekhorst's views, the Proto-Anatolian system of stops may now be fully reconstructed as follows:

	Voiceless Aspirated	Glottalized	Plain Voiced
Bilabial	p^h	p’	b
Dental	t^h	t’	d
Velar	k^h	k’	g
Labiovelar	k^{wh}	$k’^w$	g^w

Note: The velar series may be assumed to have had non-phonemic palatalized allophones in certain environments (cf. Bomhard 2023.1:119—122). These allophones became phonemic in Luwian (cf. Melchert 2017:176) as well as in several of the non-Anatolian Indo-European daughter languages — the so-called “satəm” languages.

4.3. Proto-Anatolian Consonant System

In a paper published in *Wek^{w}os* in 2019 (Bomhard 2019b), I proposed that the Proto-Anatolian stop system be reconstructed as follows, exactly as established in this chapter:

Stops:	Bilabial	Dental	Velar[35]	Labiovelar
Voiceless aspirated:	/p^h/	/t^h/	/k^h/	/k^{wh}/
Glottalized (ejectives):[36]	/p’/	/t’/	/k’/	/$k’^w$/
Plain voiced:	/b/	/d/	/g/	/g^w/

In addition, the following phonemes must be reconstructed for Proto-Anatolian:

Affricate:		/t͡s^h/		
Fricatives:		/s/	/x/ (= H_2)	/x^w/ (= H_2^w)
			/ɣ/ (= H_3)	/$ɣ^w$/ (= H_3^w)
Nasals:	/m/	/n/		
Liquids:		/r/, /l/		
Glides:	/w/	/y/		

4.4. Concluding Remarks

We have now come to the end of our study of Proto-Anatolian consonantism. As noted in Chapter 1: General Introduction, I intentionally did not discuss all of the issues regarding Anatolian phonology — the standard handbooks given in the references should be consulted for more information regarding inner-Anatolian developments. I also did not

[35] The velar series may be assumed to have had non-phonemic palatalized allophones in certain environments (cf. Bomhard 2023.1:119—122). These allophones became phonemic in Luwian (cf. Melchert 2017:176) as well as in several of the non-Anatolian Indo-European daughter languages — the so-called “satəm” languages.

[36] As previously noted, Kloekhorst (2016:226—228) considers this series to have been pre-glottalized in Proto-Anatolian.

discuss the glides or the nasals and liquids. Rather, to repeat, I have explored the important, though generally ignored, role that the older Anatolian daughter languages have to play in the reconstruction of the Proto-Indo-Anatolian consonant system, concentrating on the system of stops in this chapter. The laryngeals are not treated here — see Chapter 3 for details on the laryngeals.

In this chapter, I have tried to show that the consonant system reconstructed for Proto-Anatolian can best be explained on the basis the glottalic model of Proto-Indo-European (more accurately, Proto-Indo-Anatolian) consonantism rather than the traditional, Sanskrit-based reconstruction. ■

APPENDIX1: CORROBORATING EVIDENCE: LINGUISTICS

As is well known, the glottalic model of Proto-Indo-European consonantism (the "Glottalic Theory") has not escaped criticism. Though it generated strong interest in the scholarly community when it was first proposed, the Glottalic Theory is now mostly ignored, except among the Indo-European scholars working in Leiden, The Netherlands. It is usually only mentioned in passing in the standard handbooks. In 2016, I published a paper in *Slovo a slovesnost* in which I addressed all of the criticisms that have been lodged to date against the Glottalic Theory. Most of the criticisms were fairly easy to refute, though a minority were a bit more challenging. In the end, not a single criticism was able to withstand scrutiny — all were rejected.

The glottalic model of Proto-Indo-European consonantism was initially proposed to rectify the typological implausibility of the traditional, Sanskrit-based reconstruction, and it was based strictly on the analysis of Indo-European evidence, though typological data were used in conjunction with this analysis to demonstrate that the glottalic model represented a more natural reconstruction, with numerous parallels among attested languages.

Over the past three decades or so, especially after the collapse of the Soviet Union and the opening of new opportunities for archeologists, enormous progress has been made in substantiating the Kurgan Theory, propounded especially by the late Marija Gimbutas, according to which the homeland of the speakers of Proto-Indo-European was located on the European steppes to the north of and between the Black and Caspian Seas. So much progress has been made recently that all other theories regarding the Indo-European homeland have now been largely abandoned.

At the time the Glottalic Theory was proposed, corroborating evidence from neighboring or distantly-related languages was not brought into the picture, and such evidence has not figured prominently in discussions about Proto-Indo-European, except for some tantalizing hints in the work of Frederik Kortlandt. That gap has now been filled — on Friday, 10 July 2015, I presented a paper entitled "The Origins of Proto-Indo-European: The Caucasian Substrate Hypothesis" at a conference held at Leiden University, The Netherlands, named "The Precursors of Proto-Indo-European: The Indo-Hittite and Indo-Uralic Hypotheses". The basic premise of this paper is that, around 5,000 BCE, Pre-Indo-Europeans migrated southwestward from the area north of the Caspian and Aral Seas to the northeastern shores of the Black Sea, where they encountered and mingled with speakers of primordial Northwest Caucasian languages. The prolonged period of contact that took place between these two language groups gave rise to the form of Proto-Indo-European traditionally reconstructed in the standard handbooks. A modified and greatly expanded version of that paper subsequently appeared (2019) in the *Journal of Indo-European Studies*.

In that paper, among other things, I presented lexical evidence for language contact between Northwest Caucasian and Proto-Indo-European, proposing nearly 200 lexical parallels (as of 2023, 305 lexical parallels), arranged into semantic fields. These lexical parallels represent borrowings either from Proto-Indo-European into Northwest Caucasian or from Northwest Caucasian into Proto-Indo-European.

The most important finding from that paper, as it relates to the topics under discussion here, is that corroborating evidence providing strong support for the glottalic model of Proto-Indo-European consonantism has now been uncovered on the basis of prehistoric language contact between Proto-Indo-European and Northwest Caucasian.

The following sound correspondences can be provisionally established between Proto-Indo-European, Common Abkhaz, and Proto-Circassian (these sound correspondences are based upon the examples given in Bomhard 2019 [expanded version 2023]):

Indo-European	Common Abkhaz	Proto-Circassian
*p^h	*p	*p^h, *p:
*t^h	*t, *c, *ć, *č, *č′	*t^h, *t:, *c^h, *c:, *$č^h$, *č:, *$č^h$′, *č:′
*k^h	*k, *k′, *q	*k^h, *k:, *q^h, *q:
*k^{wh}	*k^o, *q^o	*k^{ho}, *$k:^o$, *q^{ho}, *$q:^o$
*p^hVs-	*psV-	*PsV-
*p^hV͡H₂-	*pǎV-	
*p’	*p’	*p’
*t’	*t’, *c’, *ć’, *č’, *č’′	*t’, *c’, *č’, *č’′
*k’	*k’, *k’′, *q’, *q’′	*k’, *q’
*$k’^w$	*$k’^o$, *$q’^o$	*$k’^o$, *$q’^o$
*b^h	*b	*b
*b^hVs-	*bzV-, bžV-	*PzV-
*d^h	*d, *ʒ, *ʒ́, *ǯ, *ǯ′	*d, *ʒ, *ǯ, *ǯ′
*g^h	*g, *g′, *ɣ, *ɣ′	*g, *ǧ, *ɣ
*g^{wh}	*g^o, *$ɣ^o$	*g^o, *$ǧ^o$
*s	*s, *ś, *š, *š′, *z, *ź, *ž, *ž′	*s, *ś, *š, *$š^h$, *$š^h$′, *š:, *š:′, *z, *ž, *ž′
*H_1 (= *ʔ)	*Ø	*Ø, *h
*H_4 (= *h)	*Ø	*Ø
*H_2 (= *ḫ͡h) (< *ħ)	*ħ, *x̌, *x̌′	*ħ, *x, *x̌
*H_3 (= *ʕ͡ɦ) (< *ʕ)	*ɦ (< *ʕ͡ɦ < *ʕ)	*ĝ (< *ʕ)
*w	*w	*w
*y	*j	*y
*m	*m	*m
*n	*n	*n
*n̥	*a	*a
*l	*l	*l, *ƛ
*r	*r	*r
*a, *e, *o	*a, *ə	*a, *ə
*i, *u	*ə	*ə

By way of comparison, it may be noted that Chirikba (2016: 9—11) reconstructs the early Proto-Northwest Caucasian phonological system as follows (his transcription has been retained):

Consonants:

b	p^h	p’						m	w
d	t^h	t’	ʒ	c	c’	z	s	n	
			ǯ	č	č’	ž	š	r	
			Ł	ƛ	ƛ’	L	λ	l	
g	k^h	k’				ĝ	x		j
ɢ	q^h	q’				ɣ	χ		
		ʔ				ʕ	H		

Vowels:

	i	ü		u
	e	ö	ə	o
			a	

Notes:
1. Cf. Colarusso (1989:28) for a slightly different reconstruction of the Proto-Northwest Caucasian phonological system.
2. Cf. Colarusso (1975 and 2014) for a comprehensive description and analysis of the phonological systems of the various Northwest Caucasian daughter languages.
3. Cf. Colarusso (1992) for a comparison between Proto-Indo-European and Northwest Caucasian. See also Bomhard 2019a for a positive assessment of and expansion upon Colarusso’s views.

It may be noted here that I strongly suspect that early North Caucasian languages were once more widely spread geographically. As a consequence of Indo-European expansions (and later Turkic incursions), the North Caucasian languages have been replaced over much of that area and have been slowly pushed back to their mountainous retreat in the Caucasus Mountains, where, thankfully, they survive until the present day. ■

APPENDIX 2: CORROBORATING EVIDENCE: ARCHEOLOGY AND GENETICS

There has been a tremendous amount of research appearing in print recently on the continuing advances in the gathering and analysis of archeological and genetic (aDNA) evidence from the areas surrounding the Black and Caspian Seas. For example, here is the introductory synopsis of one recent paper by Alexey Nikitin and Svetlana Ivanova (2022):

> The appearance of steppe genetic ancestry in Europe in the 3rd millennium BCE coincided with the beginning of a new cultural and economic era dominated by pastoralist economy and progressively more centralized social institutions. These genetic and socio-cultural elements were brought to Europe by the descendants of Eneolithic inhabitants of the Ponto-Caspian steppe. The details of the formation of the steppe genetic package and the identity of the contributors of its genetic components remain poorly understood. We propose that steppe genetic ancestry, as well as the cultural attributes that characterize the Early Bronze Age steppe pastoralists such as the Yamna(ya) (Pit Grave) culture complex, formed as the result of activities associated with the function of the circum-Pontic trade network. A millennium-long association among the Eneolithic cultures of the Ponto-Caspian steppe and forest-steppe, the eastern Balkan cultures of west Pontic, and populations of the Caucasus and northeast Anatolia, led to the integration of the elements of genetics, subsistence strategies, material culture, and worldview, to produce the foundation of a novel genetic and socio-cultural phenomenon by the last third of the 4th millennium BCE.

Nikitin—Ivanovna (2022) conclude:

> These trade exchanges also promoted the formation of the PCS ancestry during the second half of the 5th millennium BCE, through interactions between the steppe inhabitants and their partners in the trade of copper and other material goods. This genetic ancestry, combining EHG, CHG and, to varying extent, Neolithic Anatolian/Levantine farmer components, became the genetic signature of the Yamna people in the EBA, which spread throughout Europe by the middle of the 3rd millennium BCE. It is also conceivable that the Indo-European language group was formed within this circum-Pontic trade network and involved linguistic elements of the participant groups and cultures of Anatolia, eastern Balkans, the Ponto-Caspian steppe and adjacent forest steppe, and the Caucasus.

Other researchers include David Reich, David W. Anthony, Iosef Lazarides, and many others, especially several prominent Ukrainian archeologists and geneticists — and not to forget, once again, the late Marija Gimbutas.

As noted above, in 2019, I published a rather long paper in the *Journal of Indo-European Studies* (vol. 47, nos. 1/2, pp. 9-124) entitled "The Origins of Proto-Indo-European: The Caucasian Substrate Hypothesis". I subsequently (2023) expanded that paper into a book (146 pp.) under the title *Prehistoric Language Contact on the Steppes: The Case of Indo-European and Northwest Caucasian.* Both the paper and the book are available on academia.edu for free download. These works provide the linguistic corroboration for the growing body of archeological and genetic evidence pointing to the Pontic-Caspian steppes as the homeland of the Indo-Europeans. That is to say, this is where Proto-Indo-European (and Proto-Indo-Anatolian) formed and from which Indo-European-speaking tribes later migrated westward into Europe proper, eastward into Western China (Xinjiang), and Southeastward into Iran and India.

Chapter 5
The Reconstruction of the Proto-Indo-Anatolian Vowel System

5.1. Proto-Anatolian Vowel System

According to Kimball (2017:249—251), the following vowels are to be reconstructed for Proto-Anatolian (see also Melchert 2017:176 2020b:265; Kloekhorst 2008a:17 — Kloekhorst does not reconstruct Proto-Anatolian */æ:/):

/i/, /i:/		/u/, /u:/
/e/, /e:/		/o/, /o:/
/æ:/	/a/, /a:/	

I would reconstruct a similar set of vowels for Proto-Anatolian, except for */æ:/ and */o/ ~ */o:/ (see below). Kimball maintains that */æ:/ developed from earlier *eH_1 (see also Melchert 2017:176 and 2020b:265). Kimball does not provide justification for reconstructing */o/ ~ */o:/ for Proto-Anatolian. However, Melchert (1992:186, 1994:291—294, and 2017:176) justifies the reconstruction of Proto-Anatolian */o/ ~ */o:/ on the basis of developments in Lycian. Melchert claims that Lycian /e/ comes, in part, from earlier */o/ and provides several examples. In my opinion, we are dealing with specific Lycian developments here, inasmuch as there is absolutely no evidence from Cuneiform and Hieroglyphic Luwian for /o/ distinct from /a/, claims to the contrary notwithstanding — the much later Lycian belongs to the Luwian branch of Anatolian. The vowels */a/ and */o/ of traditional Proto-Indo-European merged in Hittite and Palaic (*a, *o > a), while the */e/, */a/, and */o/ of traditional Proto-Indo-European merged in Cuneiform and Hieroglyphic Luwian (*e, *a, *o > a).

It should be noted that Kloekhorst (2008a:35—60) provides plausible evidence for the existence of /o/ in Hittite.[2] A careful review of the evidence provided by Kloekhorst, however, indicates that this was strictly a Hittite development and should not be projected back to Proto-Anatolian — it is found in specific environments and under specific conditions (see table below; Kloekhorst also gives a comprehensive list of supporting examples). It is definitely not descended from the */o/ of traditional Proto-Indo-European, which consistently appears as /a/ in Hittite, as well as in Palaic and Cuneiform and Hieroglyphic Luwian. Kloekhorst (2008a:58—59) summarizes his findings as follows:

> On the basis of the treatments above, we arrive at the following overview of the interconsonantal reflexes of PIE *ou, *eu and *u. Note that when -$ḫ$- is the preceding consonant, the reflexes of these are always /o/.

[2] The same claim is made by Held—Schmalstieg 1969:95 (Hittite /o/ < /*au, *ou, *eu/) and Held—Schmalstieg—Gertz 1988:6. See also Melchert 2020b:263—264. According to Melchert, "…the contrast is also valid for Palaic and Luwian with differences only in detail…"

	*ou	*eu	*u	other
C_ḫ	/o/	/o/	/o/	
C_i	/o/			
C_k	/o/	/ū/	/u/	
C_l	/au/	/ū/	/u/	
C_m				
C_n OH	/au/	/ū/	/u/	/o/ < *CuHn ? /o/ < *Cóm
	↓	↓	↓	↓ ↓
NH	/ao/	/ū/	/o/	/o/ /o/
C_p	/o/	/o/	/o/	
C_r	/au/	/o/	/o/	
C_s OH	/au/	/ū/	/u/	/u/ < *ºC(o)ms /o/ < *Cóms
				↓ ↓
NH				/o/ /o/
C_t	/au/	/ū/		
C_?	/o/	/ū/		

Thus, eliminating the */æ:/ proposed by Kimball and the */o/ ~ */o:/ proposed by Kimball and Melchert, the Proto-Anatolian vowel system may be reconstructed as follows:

/i/, /i:/ /u/, /u:/
/e/, /e:/
/a/, /a: /

To complicate the situation, Proto-Indo-Anatolian must also have had non-apophonic */e/ and */o/ inherited from Proto-Nostratic. On the basis of the available lexical evidence, it appears that non-apophonic */e/ remained in Proto-Anatolian, while non-apophonic */o/ merged with */a/. In contrast, non-apophonic */e/ and */o/ remained distinct in the Indo-European ancestor of the non-Anatolian daughter languages. The development of non-apophonic */o/ in both the Anatolian and non-Anatolian daughter languages may be illustrated by the following example:

A. Anatolian: Hittite (nom. pl. ?) *ḫa-a-u-e-eš* ‘sheep’ (< [nom. sg.] **H₃owi-s*, with non-apophonic */o/ in the first syllable); Cuneiform Luwian (nom. sg.) *ḫa-a-ú-i-iš* ‘sheep’; Hieroglyphic Luwian (nom. sg.) $^{\text{OVIS.ANIMAL}}$*há-wá/í-i-sá* /hawis/ ‘sheep’; Lycian (acc. sg.) *χawã* ‘sheep’.
B. Other: Sanskrit *ávi-ḥ* ‘sheep, ram’; Greek ὄϊς, οἶς ‘sheep’; Armenian *hov-iw* ‘shepherd’; Latin *ovis* ‘sheep’; Old Irish *oí* ‘sheep’; Gothic *awēþi* ‘herd of sheep’; Old English *ēow*, *ēaw*, *ēw* ‘sheep’, *ēowu*, *ēowe* ‘ewe’, *ēowd*, *ēowde* ‘herd of sheep’; Old Frisian *ei* ‘ewe’; Old Saxon *ewwi* ‘ewe’; Dutch *ooi* ‘ewe’; Old High German *ouwi*, *ou* ‘ewe’, *ewit*, *owiti* ‘herd of sheep’; Lithuanian *avìs* ‘sheep’, *ãvinas* ‘ram’; Latvian *avs* ‘sheep’; Old Church Slavic *ovьca* (< **owi-kā*) ‘sheep’, *ovьnъ* ‘ram’; Russian *ovcá* [овца] ‘sheep, ewe’;

Czech *ovce* ‘sheep’; Polish *owca* ‘sheep’; Tocharian B *eye* ‘sheep’, *ā(u)w* ‘ewe’, *aiyye* ‘ovine, pertaining to sheep’.

Notes:

1. Kimball (1999:142) reconstructs initial **h₂-* here, but this interpretation is rejected by Kortlandt (2001:2). Kloekhorst (2008a:337—338) reconstructs **h₃eu̯i-* with initial **H₃-* as do Beekes (2010.II:1060—1061) and Derksen (2008:384 and 2015:74).
2. In my opinion, the */o/* in the initial syllable is original here, that is to say, it is inherited from Proto-Nostratic (cf. Bomhard 2023.3:930—931, no. 785, Proto-Nostratic (n.) **ʕuw-a* (~ **ʕow-a*) ‘herd of small animals, sheep and goats’).
3. Lycian (acc. sg.) *χavã* ‘sheep’ shows that initial **H₃-* became *χ-* in Lycian. However, according to Kimball (1987) and Melchert (1994a:72), initial **H₃-* was lost in Lycian. (Cf. Bomhard 2023.3:930—931, no. 785, Proto-Nostratic (n.) **ʕuw-a* (~ **ʕow-a*) ‘herd of small animals, sheep and goats’.)
4. This example shows that initial **H₃-* (Kuryłowicz’s **ə̯₃*; Sturtevant’s **γ*) became *h-* in Armenian, as did initial **H₂-* (Kuryłowicz’s **ə̯₂*; Sturtevant’s **x*).

5.2. History of the Reconstruction of the Proto-Indo-European Vowel System

There is a strong temptation to project the Proto-Anatolian vowel system reconstructed above back into its Proto-Indo-Anatolian ancestor. However, is this really justified? Is it not possible instead to see hints of an even earlier system? Indeed, it is. Let us review the evidence (this is a slightly modified version of Bomhard 2023.1:123—134).

The first attempt to reconstruct the Proto-Indo-European vowel system was made by August Schleicher. Schleicher’s system was as follows (1876:11):

	Original Vowel	First Increment	Second Increment
a-grade	a	a + a = aa	a + aa = āa
i-grade	i	a + i = ai	a + ai = āi
u-grade	u	a + u = au	a + au = āu

Even though Schleicher’s system, which was modeled after that of Old Indic, was able to account for many of the developments found in the Indo-European daughter languages, there remained many unsolved problems, and his system did not endure the onslaughts of a series of brilliant discoveries made in the seventies of the nineteenth century by a younger generation of scholars, the so-called “Neogrammarians” (Junggrammatiker).

Perhaps the most important discovery of the Neogrammarian period was the “Law of Palatals” (cf. Collinge 1985:133—142), according to which an original **k*, for example, developed into *c* in Old Indic under the influence of a following **ĕ*, **ī̆*, or **y*. This discovery firmly established the primacy of the vowel systems found in the European daughter languages and proved that the Indo-Iranian system had resulted from an innovation in which original **ĕ*, **ŏ*, and **ă* had merged into **ă*. Also important was the demonstration by the Neogrammarians that the Indo-European parent language had syllabic liquids and nasals.

According to the Neogrammarians (cf. Hübschmann 1885; Brugmann 1904:52 and 66—99), Proto-Indo-European had the following vowel system:

Monophthongs:	e	o	a	i	u	ə		
	ē	ō	ā	ī	ū			
Diphthongs:	e̯i̯	o̯i̯	a̯i̯	ə̯i̯	e̯u̯	o̯u̯	a̯u̯	ə̯u̯
	ēi̯	ōi̯	āi̯		ēu̯	ōu̯	āu̯	
Semivowels:	i̯	u̯	(j ?)					

Brugmann (1904:52) also reconstructs the following syllabic liquids and nasals:

l̥	r̥	m̥	n̥	n̥̂	ə̥
l̥̄	r̥̄	m̥̄	n̥̄	n̥̂̄	ə̥̄

Throughout the greater part of the twentieth century, the Neogrammarian view was steadily attacked. It was dealt its first major blow in 1927 with Kuryłowicz's demonstration that one of de Saussure's "coefficients sonantiques" was preserved in Hittite. In one fell swoop, the so-called "original" long vowels (as well as the long syllabic liquids and nasals) were eliminated as was **a*, which was taken to result from **e* when next to an "*a*-coloring" laryngeal. The next to go were the diphthongs, which were reanalyzed as clusters of vowel plus non-syllabic resonant and non-syllabic resonant plus vowel (cf. Lehmann 1952:10—14). The independent status of **i* and **u* had early been questioned by Meillet (1964:118—122), who regarded them as the syllabic forms of **y* (**i̯*) and **w* (**u̯*), respectively. Finally, a strict adherence to Hirt's Ablaut and accentuation theories made it possible to eliminate apophonic **o*, which was taken to result from an earlier **e* when the accent was shifted from the **e* to another syllable (cf. Burrow 1973:112—113; Hirt 1921—1927.II:173—179; Lehmann 1952:109—110). By applying all of these theories, it became possible to reduce the Proto-Indo-European vowel system to a single member: **e*.

It should be made clear that this extreme view was never universally accepted. In fact, it was vigorously attacked by several scholars, including Roman Jakobson (1971[1957]:528), who soberly noted: "The one-vowel picture of Proto-Indo-European finds no support in the recorded languages of the world." See also Trubetzkoy 1969:96.

In 1967, Szemerényi, relying heavily on typological data to support his arguments, reinstated all of the vowels reconstructed by the Neogrammarians:

e	o	a	i	u	ə
ē	ō	ā	ī	ū	

Szemerényi (1967:97, fn. 91), however, ignores the diphthongs, "whose phonemic status is disputed". I fully support Szemerényi's views on the vowels and would reconstruct an identical system for the Proto-Indo-European antecedent of the non-Anatolian daughter languages.

Proto-Indo-European, as also, for example, Proto-Kartvelian, Northwest Caucasian, and Proto-Semitic, was characterized by an interchange of vocalic elements that could occur in any syllable. This interchange, which is commonly called "Ablaut", "apophony", or "vowel gradation", was partially correlated with the position of the accent and with distinctions between grammatical relationships (cf. Burrow 1973:108—117). According to the traditional reconstruction, the fundamental vowel was **e*, which could be changed to **o* under certain conditions. Under other conditions, however, the vowel could either be reduced or even lost altogether. Finally, the position of the fundamental vowel could change — this type of alternation is known as "Schwebeablaut" (for details, cf. Anttila 1969). An example here would be **k'en-u* 'knee' (cf. Hittite *gi-e-nu* 'knee'; Latin *genu* 'knee'), as opposed to **k'n-ew-* also 'knee' (cf. Gothic *kniu* 'knee'; Old Icelandic *kné* 'knee'; Old English *cnēo* 'knee'; Old Frisian *kniu*, *knē*, *knī* 'knee'; Old Saxon *knio* 'knee'; Old High German *kneo*, *knio* 'knee').

Several gradation series are traditionally distinguished, and the general scheme may be represented as follows (cf. Beekes 1995:164—167; Brugmann 1904:138—150; Buck 1933:106—117; Clackson 2007:71—75; Fortson 2010:79—83; Hirt 1900 and 1921—1927, vol. II; Hübschmann 1885:71—180; Kuryłowicz 1956 and 1968:199—333; Meier-Brügger 2003:144—152; Meillet 1964:153—168; Sihler 1995:108—135; Szemerényi 1996:83—93; Watkins 1998:51—53):

I. Short Vowel Gradation:

	Lengthened-Grade	Normal-Grade	Reduced-Grade	Zero-Grade
A.	ē ~ ō	e ~ o	ə (traditional schwa secundum, *ъ or *$_e$)	Ø
B.	ēy ~ ōy	ey ~ oy	i, əyV (> iyV)	y
	ēw ~ ōw	ew ~ ow	u, əwV (> uwV)	w
	ēm ~ ōm	em ~ om	m̥, əmV (m̥mV)	m
	ēn ~ ōn	en ~ on	n̥, ənV (n̥nV)	n
	ēl ~ ōl	el ~ ol	l̥, əlV (l̥lV)	l
	ēr ~ ōr	er ~ or	r̥, ərV (r̥rV)	r
C.		a ~ o	ə	Ø
D.		ay	i, əyV (> iyV)	y
		aw	u, əwV (> uwV)	w

II. Long Vowel Gradation:

E.	ē ~ ō	h̥ (traditional schwa primum, **ə*)
F.	ō	h̥
G.	ā ~ ō	h̥

In this scheme, the most common vowel was **e*, and the most common gradation pattern was the **e* ~ **o* contrast. The vowel **a* was of relatively low statistical frequency and, at least according to Meillet (1964:154), did not take part in the regular gradation

patterning. It should be pointed out, however, that several rare examples of an **a* ~ **o* contrast are attested in the non-Anatolian daughter languages, one probable example being:

Greek ἄγω ‘to lead, to carry, to convey, to bring’
ὄγμος ‘any straight line: a furrow, path, etc.’

Colarusso (1981:499) has astutely observed: “…the PIE vowel system **e* ~ **o* is typologically utterly bizarre. Even adding **a* to this system does not change this fact.” Perhaps the most typologically unusual thing about the Proto-Indo-European vowel system as traditionally reconstructed is indeed the great importance of the **e* ~ **o* Ablaut and the concomitant marginality of **a*. Adding laryngeals only makes the system even more unusual since **a* then becomes mostly (but not in every case!) a positional variant of **e*. Rather, we would expect the relationship to be reversed. All languages surveyed by Crothers (1978:93—152) have the vowel /a/, and this vowel is consistently characterized by a high frequency of occurrence (cf., for example, the frequency counts given in Greenberg 1966:18—19). Moreover, in the Kartvelian languages, Northwest Caucasian languages, and Semitic languages, which also exhibit Ablaut either as an active process or as a relic of an earlier, fully functioning Ablaut process, the vowel /a/ is an integral part of the Ablaut system (cf. Gamkrelidze 1966:80—81 for Kartvelian; Colarusso 1981:499—502 for Northwest Caucasian; and Kuryłowicz 1962 for Semitic). Clearly, if typological evidence is to have any meaning, there is something wrong with the traditional reconstruction of the Proto-Indo-European vowel system. Yet, if the Comparative Method is to have any validity, there must be some truth to that reconstruction.

This seeming conflict can be resolved quite easily, I believe. We can consider the traditional reconstruction to be mainly correct, but only for that form of Proto-Indo-European spoken immediately prior to the emergence of the non-Anatolian daughter languages, that is, what I call “Disintegrating Indo-European”. The vowel system of this form of Proto-Indo-European is by no means ancient and is the end product of a long, complicated evolution.

The earliest Proto-Indo-European (Proto-Indo-Anatolian) vowel system may thus be reconstructed as follows:

Vowels:	i		u		
	e		o		
		ə ~ a			
Also the sequences:	iy	uy	ey	oy	əy ~ ay
	iw	uw	ew	ow	əw ~ aw

Notes:

1. */e/ and */o/ represent so-called “non-apophonic” */e/ and */o/. These vowels were not involved in the qualitative Ablaut traditionally reconstructed (see below).
2. There may have been corresponding long vowels as well, but this is uncertain. Some words, such as **mā-* ‘mother’ (no laryngeal! — not **meA-*!), must always have had a long vowel (cf. Jakobson 1971[1960]).

I follow Pulleyblank (1965:86—101) in his reinterpretation of the *e ~ *o Ablaut of traditional Proto-Indo-European as an *ə ~ *a Ablaut. Pulleyblank was not the first to suggest such a reinterpretation. Pulleyblank mentions that a similar Ablaut pattern exists in Kabardian. Colarusso (1981:499—501) proposes a similar reinterpretation and also discusses possible typological parallels with the Northwest Caucasian languages.

According to Hirt (1921:172—199) and those who follow his theories (Burrow and Lehmann, for example), the oldest Ablaut alternation was the full-grade ~ zero-grade contrast. This alternation is assumed to have arisen at a time when the Proto-Indo-European (better, Proto-Indo-Anatolian) phonological system was characterized by a strong stress accent. This accent caused the weakening and loss of the vowels of unstressed syllables. This period may be called the Phonemic Stress Stage of Proto-Indo-European (cf. Lehmann 1952:111—112). At a later date, stress became phonemically non-distinctive, and Proto-Indo-European was characterized by an accent system based on pitch. This period may be called the Phonemic Pitch Stage of Proto-Indo-European (cf. Lehmann 1952:109—110). It was supposedly during this period that the *e ~ *o contrast came into being. *e is assumed to have been changed to *o when the accent was shifted from the *e to another syllable. These theories find support in the fact that the position of the accent is partially correlated with Ablaut patterning in both Greek and Old Indic. Counter-examples are usually explained as due to analogical developments or as later forms that came into being after the accent lost its ability to influence the vowels (cf. Burrow 1973:112).

Though Kuryłowicz originally adhered to Hirt's theories as well, he later (1956:36—96) tried to show that the *e ~ *o contrast existed prior to the development of the full-grade ~ zero-grade contrast. Kuryłowicz argues that the numerous counter-examples with accented *o indicate that qualitative Ablaut was a morphological device in its own right and only superficially connected with the positioning of the accent. Moreover, he notes that, while vowel weakening and loss are closely tied to the accent, a change in vowel quality is primarily due to the environment — in other words, there is no cause-and-effect relationship between qualitative Ablaut and accentuation. These are convincing arguments and are the primary basis for my belief that qualitative Ablaut existed at the earliest reconstructable period of Proto-Indo-European. Moreover, Kuryłowicz's views find support in the data from the other Nostratic languages (note here especially Greenberg 1990:125: "… the Indo-European *e*:*o* (i.e. *e*:*a*) Ablaut is very old and is part of a larger system of alternations which has correspondences in a number of other branches of Eurasiatic").

The development of *ə into *e, which must have occurred fairly early since it is already found in Hittite, is relatively easy to explain: *e was the normal allophone of *ə under stress. John Colarusso (personal correspondence) has informed me of a similar development in Ubykh and Circassian, where accented /ə/ > [e].

We may assume that *a had a rounded allophone in certain phonetic environments (cf. Colarusso 1981:500), perhaps next to labiovelars as well as when next to *w. In late Disintegrating Indo-European, these allophones were reapportioned, and apophonic *a was rephonemicized as *o. That this is an extremely late development is shown (A) by the fact that it had not yet occurred in the Anatolian languages and (B) by the widespread tendency of *a and *o to have identical reflexes in several of the non-Anatolian daughter languages. No doubt, the phonemicization of apophonic *o was facilitated by the presence of non-

apophonic **o* in the system. This does not mean, however, that **a* was totally eliminated. In fact, the vowel **a* must be reconstructed as an independent phoneme distinct form **o* for Disintegrating Indo-European (cf. Szemerényi 1964a:2—9, 1967:83—84, and 1996:135—136). Disintegrating Indo-European **a* had several sources: First, it arose from the lowering and coloring of **e* (< **ə́*) when next to *a*-coloring laryngeals. Next, it was found in a small number of relic forms that somehow escaped conversion to the regular **e* ~ **o* Ablaut patterning as traditionally reconstructed. Finally, in was retained in loanwords from other languages. (Cf. Kümmel 2012:306—310 for a somewhat different approach; see also Hovers 2021.)

The origin of the Proto-Indo-European long vowels has always been enigmatic. Many theories have been proposed, none of which has been completely convincing. One thing seems certain, though: the long vowels developed over a long period of time and had several causes.

The evidence for the existence of original long vowels is meager at best, and there seems little reason to suppose that long vowels existed in Pre-Proto-Indo-European. Rather, long vowels may be assumed to have arisen solely in Proto-Indo-European proper. First, long vowels arose from the contraction of two short vowels. Though probably not frequent in the earlier stages of development, contraction became increasingly important, especially in the later stages of the Indo-European parent language and the earlier stages of the non-Anatolian daughter languages, when the upheavals caused by the loss of whole classes of phonemes — such as the laryngeals, for example — often brought two or more previously separated vowels into contact. Long vowels also arose from the monophthongization of diphthongs and from the lengthening of short vowels to compensate for the loss of a following phoneme. The most important cause of compensatory lengthening was the loss of preconsonantal laryngeals after short vowels in Disintegrating Indo-European. Finally, long vowels arose by means of the analogical process known as "vṛddhi" (cf. Burrow 1973:199—291; Kuryłowicz 1968:298—307).

In reconstructing the Proto-Indo-European phonological system, the vowels **i* and **u* are usually treated as allophones of **y* (**i̯*) and **w* (**u̯*) respectively and are classed with the resonants **m*/**m̥*, **n*/**n̥*, **l*/**l̥*, **r*/**r̥* (cf. Lehmann 1952:10—14; Meillet 1964:105—126). However, as pointed out by Szemerényi (1967:82), the patterning of these sounds is not entirely parallel. For the earliest form of Proto-Indo-European (Proto-Indo-Anatolian), **i* and **u* should, in fact, be considered as independent phonemic entities and should be classed with the vowels rather than the resonants. The glides **y* and **w* should also be considered as independent phonemes during the early stages of development within Proto-Indo-European. At a later date, however, after various sound changes had taken place, the patterning had been modified in such a way that **i* ~ **y* and **u* ~ **w* were mostly in complementary distribution (cf. Gamkrelidze—Ivanov 1995.I: 137—138; Schmitt-Brandt 1973:79—91; Szemerényi 1996:136. As further noted by Gamkrelidze—Ivanov (1995.I: 141—142), the changes alluded to above brought about a major restructuring of the functional role of the high vowels **i* and **u* (this version differs slightly from the English translation made by Johanna Nichols — here, the term "resonant" has been substituted for "sonant" [Russian сонант]):

These phonetic and phonemic changes inevitably led to a split of the consonants into consonants proper and resonants (*i̯*, *u̯*, *r*, *l*, *m*, *n*). The resonants had syllabic and non-syllabic allophones depending on context, while the consonants proper had only non-syllabic allophones (and the vowels were exclusively syllabic in all positions). Consequently, resonants had the feature value [±syllabic], in contrast to consonants proper [-syllabic] and vowels [+syllabic].

These changes produced a major restructuring of the vowel system. The original high vowels *i* and *u* became identified with the syllabic allophones of *i̯* and *u̯*. Hence, they acquired the status of resonants, specifically, the syllabic allophones of resonants. These vowels had not formerly been in alternation with non-syllabic elements but were now pulled into the system of resonant alternations, which severed their connection to the class of vowels.

This reanalysis of original *i* and *u* led, in some cases, to secondary full-grade formations, with *V* being inserted into roots in which *i* or *u* had originally been root vowels but which were now interpreted as zero-grade resonants. This apparently took place in the parallel markers of the Indo-European locative *-*i*/*-*ei̯*. Of the two locative forms, the stressed *-*i* is clearly the older and reflects the ancient full-grade vowel **i*: Gk. ποδ-ί, Skt. *pad-í* 'in the foot', *dat-í* 'in the tooth', *janas-í* 'in birth', Hitt. *nepiš-i* 'in the sky', beside the later Slavic *nebes-i* 'in the sky'. Other full-grade forms in which the diphthongs *ei̯* and *eu̯* correspond to *i* and *u* in the zero-grade, often adduced as illustration of the full-grade ~ zero-grade alternation, may well represent later formations from roots with original **i* and **u* which were secondarily identified with syllabic resonants and reinterpreted as zero-grade.

According to the traditional reconstruction, Proto-Indo-European is assumed to have had the following short diphthongs:

ei̯	oi̯	ai̯	əi̯
eu̯	ou̯	au̯	əu̯

In the reduced-grade, the semivowels alone appear:

i
u

Szemerényi (1996:141) notes that, while this looks good on paper, it is difficult to imagine the process that would have led to **i* and **u* in the reduced-grade. He points out that it most certainly could not have been due to a simple loss of **e*, **o*, and **a*. The actual process leading to the appearance of **i* and **u* in the reduced-grade was probably along the following lines:

A. After phonemicization of a strong stress accent, stress-conditioned weakening of the vowel to **ə* (= traditional schwa secumdum, *ъ or *$_e$) in unstressed syllables.
B. Assimilation of **ə* to **i* before **y* and to **u* before **w*.
C. Passage of **iy* to **ī* and of **uw* to **ū*.
D. Shortening of **ī* to **i* and of **ū* to **u*.

A typological parallel exists in Riffian Berber, where *itawi-d* 'he brings' developed from earlier **yəttawəy-dd*, with both **yə* and **əy* > *i* (cf. Kossmann 2012:28). The same development may be observed in Kabardian (cf. Chirikba 1996a:52).

This is only part of the story, however, since it focuses primarily on the developments affecting the Pre-Proto-Indo-European **əy ~ *ay* and **əw ~ *aw*. Pre-Proto-Indo-European also had the following sequences: **iy ~ *ey*, **uy ~ *oy*, **iw ~ *ew*, and **uw ~ *ow*, and these need to be considered as well. A summary of the developments is given below (only the beginning and end points are shown):

əyC	>	eyC	when stressed
əyC	>	ayC	when stressed and preceded by an *a*-coloring laryngeal
əyV	>	eyV	when stressed
əyV	>	ayV	when stressed and preceded by an *a*-coloring laryngeal
əyC	>	iC	when unstressed
əyV	>	iyV	when unstressed
ayC	>	oyC	when stressed
ayV	>	oyV	when stressed
ayC	>	iC	when unstressed
ayV	>	iyV	when unstressed
iyC	>	īC	when stressed
iyC	>	ēC	when stressed and preceded by an *a*-coloring laryngeal
iyV	>	iyV	when stressed
iyV	>	eyV	when stressed and preceded by an *a*-coloring laryngeal
iyC	>	iC	when unstressed
iyV	>	iyV	when unstressed
eyC	>	ēC	when stressed
eyV	>	eyV	when stressed
eyC	>	iC	when unstressed
eyV	>	iyV	when unstressed
uyC	>	īC ?	when stressed
uyC	>	ēC ?	when stressed and preceded by an *a*-coloring laryngeal
uyV	>	iyV ?	when stressed
uyV	>	eyV ?	when stressed and preceded by an *a*-coloring laryngeal
uyC	>	iC	when unstressed
uyV	>	iyV	when unstressed
oyC	>	oyC	when stressed
oyV	>	oyV	when stressed
oyC	>	iC	when unstressed
oyV	>	iyV	when unstressed
əwC	>	ewC	when stressed
əwC	>	awC	when stressed and preceded by an *a*-coloring laryngeal
əwV	>	ewV	when stressed

əwV	>	awV	when stressed and preceded by an *a*-coloring laryngeal
əwC	>	uC	when unstressed
əwV	>	uwV	when unstressed
awC	>	owC	when stressed
awV	>	owV	when stressed
awC	>	uC	when unstressed
awV	>	uwV	when unstressed
uwC	>	ūC	when stressed
uwC	>	ōC	when stressed and preceded by an *a*-coloring laryngeal
uwV	>	uwV	when stressed
uwV	>	owV	when stressed and preceded by an *a*-coloring laryngeal
uwC	>	uC	when unstressed
uwV	>	uwV	when unstressed
owC	>	ōC	when stressed
owV	>	owV	when stressed
owC	>	uC	when unstressed
owV	>	uwV	when unstressed
iwC	>	ūC ?	when stressed
iwC	>	ōC ?	when stressed and preceded by an *a*-coloring laryngeal
iwV	>	uwV ?	when stressed
iwV	>	owV ?	when stressed and preceded by an *a*-coloring laryngeal
iwC	>	uC	when unstressed
iwV	>	uwV	when unstressed
ewC	>	ewC	when stressed
ewV	>	ewV	when stressed
ewC	>	uC	when unstressed
ewV	>	uwV	when unstressed

In addition to the sequences of vowel plus **y* and **w*, the earliest form of Proto-Indo-European also had sequences of **y* and **w* plus vowel. In unstressed positions, the vowel was first reduced to **ə*. **ə* was then assimilated to **i* after **y*, and the preceding **y* was lost, while after **w*, it was assimilated to **u*, and the preceding **w* was lost:

yəC	>	yiC	>	iC
wəC	>	wuC	>	uC

The vowels **i* and **u* were converted into the corresponding glides **y* and **w* respectively when directly followed by another vowel:

iV	>	yV

uV > wV

In a 1967 book devoted to the study of the Indo-European vowel system, Robert Schmitt-Brandt (1967:8—31 [2nd edition 1973]) concludes that it is necessary to assume a fundamental form in *i and *u for certain kinds of roots in Proto-Indo-European and to view the full-grade forms as secondary. This conclusion is reached on the basis of the observation that, as a general rule, when diphthongs are "reduced", long monophthongs result and not, as traditionally assumed, short monophthongs. Support for this conclusion is to be found in root-nouns, which appear in the reduced-grade (Schmitt-Brandt cites *$di\hat{k}$-, *$wi\hat{k}$-, and *duk- [I would write *$t'ik^h$-, *wik^h-, and *$t'uk^h$-, following the glottalic model of Proto-Indo-European consonantism] as examples), this being their original form. To have it the other way around, with *ey, *ew, etc. as the original forms, would lead, in Schmitt-Brandt's opinion, to reduced-grade forms with *$\bar{\imath}$ and *$\bar{u}$: *$dey\hat{k}$- > *$d\bar{\imath}\hat{k}$-, *$wey\hat{k}$- > *$w\bar{\imath}\hat{k}$-, and *$dewk$- > *$d\bar{u}k$-, etc. Schmitt-Brandt thus posits *i and *u as independent vowels in Proto-Indo-European and explains the full-grade forms in *ey, *ew, etc. as due to analogy. Finally, Schmitt-Brandt (1967:79—91) explains that, in an earlier period of Proto-Indo-European, *y and *w (he writes *$\underset{\cdot}{i}$ and *$\underset{\cdot}{u}$) were consonants in their own right and were not connected with the independent vowels *i and *u. Somewhat similar views are expressed by William F. Wyatt (1970:58 and fn. 24).

The parts of Schmitt-Brandt's theories outlined in the preceding paragraph make a lot of sense, at least on the surface. Other parts of his theories, however, have purposely been left out of the discussion since, at least in my opinion, they are less convincing (see here the review of Schmitt-Brandt's book by Kuryłowicz 1969:41—49). What Schmitt-Brandt has correctly identified is the fact that, in certain specific instances, it is necessary to assume secondary full-grade forms. Schmitt-Brandt is also correct in seeing the vowels *i and *u as independent vowels at an early stage of development within Proto-Indo-European. Where his theories are mistaken, however, is in the assumption that the reduction of diphthongs can only lead to long monophthongs. While this is indeed a very common development, it is not the only possible outcome. Here, we can cite developments in the Romance languages: Classical Latin had both long vowels and short vowels along with three diphthongs, namely, *ae*, *oe* and *au*. In Vulgar Latin, length distinctions were lost, and the earlier long vowels were realized as closed vowels, while the earlier short vowels were realized as open vowels. At the same time, *ae* > open *e* [ę], *oe* > closed *e* [ẹ], and *au* > closed *o* [ọ] (though there is actually a great deal of variation in the development of *au*). In Balkan Romance, unstressed front vowels merged into [e], and unstressed back vowels merged into [u], except for [a] and [i̯] (closed [i] < Classical Latin *ī*), which remained intact. (Cf. Mendeloff 1969:4—16 for details about the development of the vowels and diphthongs in the Romance languages.) Another problem with Schmitt-Brandt's theories concerns the failure to recognize the fact that the latest period of Proto-Indo-European contained the remnants of multiple successive earlier periods of development. The reduction of diphthongs in unaccented syllables had a different outcome in the earliest period than in later periods — in the earliest period, short monophthongs resulted from the stress-conditioned weakening of diphthongs in unstressed syllables, while in later periods, when stress was no longer phonemically distinctive, long monophthongs resulted.

In Post-Anatolian Proto-Indo-European, secondary diphthongs arose as follows: By this time, the **e* ~ **o* Ablaut patterning had assumed an important role in the emerging morphological system of Proto-Indo-European. In order to bring stems such as **t'ik^h-*, **wik^h-*, and **t'uk^h-* (traditional **diĥ-*, **wiĥ-*, and **duk-*), and the like into line with the regular **e* ~ **o* Ablaut patterning as traditionally reconstructed, **e* and **o* were inserted before accented **i* and **u*, thus creating secondary diphthongs:

Ø > *e* and *o* /___ { í, ú } in **t'ík^h-*, **wík^h-*, **t'úk^h-*, yielding **t'éyk^h-*, **wéyk^h-*, **t'éwk^h-*, etc.

The development of secondary diphthongs was restricted to certain specific grammatical environments (such as the singular indicative verbal forms) — that is to say, not every accented **í* and **ú* was affected (cf., for example, forms such as Sanskrit nom. sg. *agní-ḥ* 'fire' and *sūnú-ḥ* 'son' or Hittite nom. sg. *šal-li-iš* 'glorious' and *a-aš-šu-uš* 'good', which must always have had **í* and **ú*). We may note at this point that secondary full-grade forms could also be created from syllabic resonant stems when the accent was shifted to the stem from another syllable (**Cḿ̥-* > **Cém-*, **Cń̥-* > **Cén-*, **Cĺ̥-* > **Cél-*, **Cŕ̥-* > **Cér-*).

The picture is still not complete, though, for we must also consider how laryngeals fit into the picture: The loss of laryngeals in sequences such as **eHiC*, **eHuC*, and the like resulted in short diphthongs when accented (**éHiC* > **eyC* and **éHuC* > **ewC*, etc.) — the preceding vowel was definitely not lengthened — but long monophthongs when unaccented (**əHiC* > **əyC* > **iyC* > **īC* and **əHuC* > **əwC* > **uwC* > **ūC*, etc.). Since these changes were later than the changes previously described and since stress was no longer phonemically distinctive, the resulting long monophthongs were not shortened to **i* and **u* respectively. In sequences such as **eHa^{x}C* and the like, the loss of the intervocalic laryngeal first produced a sequence of two short vowels. These vowels were then contracted to form a long vowel: **eHa^{x}C* > **ea^{x}C* > **ēC*, **oHa^{x}C* > **oa^{x}C* > **ōC*, **aHa^{x}C* > **aa^{x}C* > **āC*.

We may close this section by mentioning one last point. The numerous cases of vṛddhied stems in the non-Anatolian daughter languages — especially Old Indic — appear to represent a contamination of types **CēC* and **CōC* with types **CeyV-*/ **CoyV-* and **CewV-*/**CowV-*, producing the new types **CēyV-*/**CōyV-* and **CēwV-*/**CōwV-* (cf. Schmalstieg 1973:108).

5.3. Examples

Selected Hittite declensions:

1. *at-ta-aš* 'father' (common gender *a*-stem; mobile accent; *a*-grade generalized throughout the paradigm; nursery word):

Singular:	Hittite	Indo-Anatolian	Indo-European
Nominative	*at-ta-aš*, *ad-da-aš*	**H$_1$át^{h}t^{h}as*	**H$_1$át^{h}t^{h}os*

Accusative	*at-ta-an*, *ad-da-an*	*H_1át^{h}t^{h}am*	*H_1át^{h}t^{h}om*
Vocative (no accent)	*at-ta*	*H_1at^{h}t^{h}a*	*H_1at^{h}t^{h}o*
Genitive	*at-ta-aš*, *ad-da-aš*	*H_1at^{h}t^{h}ás*	*H_1at^{h}t^{h}ós*
Dative-Locative	*at-ti*	*H_1at^{h}t^{h}í*	*H_1at^{h}t^{h}í ~ *H_1at^{h}t^{h}éy / *H_1at^{h}tóy*
Ablative (sg./pl.) Instrumental (sg./pl.) Allative / Directive	*at-ta-az*	*H_1at^{h}t^{h}át^{h}s*	*H_1at^{h}t^{h}ót^{h}s*
Plural:			
Nominative	*at-ti-e-eš*	*H_1át^{h}t^{h}es*	*H_1át^{h}t^{h}es*
Accusative	*at-tu-uš*, *ad-du-uš*	*H_1át^{h}t^{h}m̥s*	*H_1át^{h}t^{h}m̥s*
Genitive	*ad-da-aš*	*H_1at^{h}t^{h}ás*	*H_1at^{h}t^{h}ós*
Dative-Locative	*ad-da-aš*	*H_1at^{h}t^{h}ás*	*H_1at^{h}t^{h}ós*

Cognates:

A. Anatolian: Cuneiform Luwian (nom. sg.) *ta-a-ti-iš* ‘father’; Hieroglyphic Luwian (nom. sg.) *tá-ti-sa* ‘father’; Lycian (nom. sg.) *tedi* ‘father’; Lydian *taada-* ‘father’. All from Proto-Indo-Anatolian *$t^hat'a/i$- (traditional *todo-*) ‘father’.

B. Other: Assamese *ātā* term of respect when addressing an older male; Sinhalese *ātā* ‘grandfather’; Sindhi *ado* ‘brother’; Greek ἄττα ‘daddy’; Latin *atta* term of respect when addressing an older male, ‘father, grandfather’; Old Irish *aite* ‘father’; Gothic *atta* ‘father’; Old Icelandic *atti* ‘father’; Old High German *atto* ‘forefather’; East Frisian *atte*, *ette* ‘father’;Old Church Slavic *отьсь* ‘father’; Russian *otéc* [отец] ‘father’; Czech, Slovak *otec* ‘father’; Serbo-Croatian *òtac* ‘father’; Albanian *at*, *ati*, *atë* ‘father’.

Kloekhorst 2008a:225—226; Puhvel 1984— .1/2:224—226; Tischler 1977— .I:92—93; Friedrich 1991:38; Sturtevant 1936:32 and 1951:§58, §70, §132a; Gusmani 1980—1982:98; Melchert 1993a:69 and 1993b:221; Pokorny 1959:71 *ă̆tos*, *atta*; Walde 1927—1932.I:44 *atta*; Mann 1948:14 and 1984—1987:39 *atā* (*attā*, *-os*, *-i̯os*) ‘daddy’; Watkins 2000:6 *atto- ‘father’; Mallory—Adams 1997:195 *at- (or *$h_a$et- or *$h_1$at- ?) ‘father’; Buck 1949:§2.35 father; Turner 1966—1969.I:12, no. 221, *atta- ‘father, grandfather’; Walde—Hofmann 1965—1972.I:77 *ă̆to-lo-; Ernout—Meillet 2001:54; De Vaan 2008:60 *$h_2$et-o- a nursery word for ‘father’; Boisacq 1950:98; Beekes 2010.1:165; Hofmann 1966:27; Frisk 1970—1973.I:182; Chantraine 1968—1980.I:135; Matasović 2009:46 Proto-Celtic *attyo- ‘father, foster father’, Proto-Indo-European *atta ‘father’; Orël 1998:14 and 2003:27 Proto-Germanic *attōn ‘father’; Kroonen 2013:39 Proto-Germanic *attan- ‘father’; Feist 1939:62; Lehmann 1982:46; Schuhmann 2024:28, no. 85, Proto-Germanic *attan-; Uhlenbeck 1900:18; De Vries 1977:17; Derksen 2008:383 Proto-Slavic *отьсь ‘father’; Huld 1984:39; Bomhard 2023.3:786—787, no. 660, Proto-Nostratic *ʔat^{h}t^{h}a ‘older male relative, father’ (nursery word).

2. *an-na-aš* ‘mother’ (common gender *a*-stem; mobile accent; *a*-grade generalized throughout the paradigm; nursery word):

Singular:	Hittite	Indo-Anatolian	Indo-European
Nominative	*an-na-aš*	**H₁ánnas*	**H₁ánnos*
Accusative	*an-na-an*	**H₁ánnam*	**H₁ánnom*
Vocative (no accent)			
Genitive	*an-na-aš*	**H₁annás*	**H₁annós*
Dative-Locative	*an-ni*	**H₁anní*	**H₁anní ~ *H₁annéy / *H₄annóy*
Ablative (sg./pl.)	*an-na-az*, *an-na-za*	**H₁annáths*	**H₁annóths*
Instrumental (sg./pl.)			
Allative / Directive	*an-na*	**H₁anná*	
Plural			
Nominative	*an-ni-iš*	**H₁ánnes*	**H₁ánnes*
Accusative	*an-nu-uš*, *an-ni-uš*	**H₁ánnm̥s*	**H₁ánnm̥s*
Genitive			
Dative-Locative			

Cognates:

A. Anatolian: Palaic (nom. sg.) *an-na-aš* ‘mother’; Cuneiform Luwian (nom. sg.) *a-an-ni-iš* ‘mother’, (nom. sg.) *a-an-na-wa-an-n[i-iš]* ‘stepmother’; Hieroglyphic Luwian MATER-*nati-* (= /anant(i)-/ ?) ‘mother’; Lydian *ẽna-*, *ẽnar-* ‘mother’; Lycian *ẽne/i-* ‘mother’; Milyan *ẽne/i-* ‘mother’; Carian *en* ‘mother’. Note: Not related to Hittite (nom. sg.) *ḫa-an-na-aš* ‘grandmother’ < **H₂anna-* (Proto-Indo-European **H₂anno-*).
B. Other: Latin *anna* ‘foster-mother’; (?) Greek (Hesychius) ἀννίς· ‘grandmother’.

Kloekhorst 2008a:174 Proto-Anatolian **Honno-*; Puhvel 1984— .1/2:55—57; Tischler 1977— .I:24—25; Friedrich 1991:21; Sturtevant 1936:21; Gusmani 1980—1982:51; Melchert 1993a:23 and 1993b:12; Simon 2023, Carian no. 30; Walde 1927—1932.I:55—56 **an-*; Pokorny 1959:36—37 **an-*; Mann 1984—1987:21 **anā* (hypocoristic) ‘mother, grandmother’; Watkins 2000:4 **an-* ‘old woman, ancestor’; Mallory—Adams 1997:385—386 **h₄en-* (or **an-*) ‘(old) woman, mother’; Buck 1949:§2.36 mother; Walde—Hofmann 1965—1972.I:50; Beekes 2010.1:107; Frisk 1970—1973.I:112; Hofmann 1966:19; Chantraine 1968—1980.I:91; Bomhard 2023.3:775—776, no. 649, Proto-Nostratic **ʔanʸa* ‘mother, aunt’ (nursery word).

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3. *e-eš-ḫar* ‘blood’ (neuter gender *r/n*-stem; mobile accent; *e*-grade generalized throughout the paradigm):

Singular:	Hitttite	Indo-Anatolian	Indo-European
Nom.-Acc.	*e-eš-ḫar*,	**H₁ésH₂r̥*	**H₁ésH₂r̥*

	iš-ḫar		
Vocative (no accent)			
Genitive	*iš-ḫa-na-a-aš*, *iš-ḫa-a-na-aš*, *iš-ḫa-na-aš*, *e-eš-ḫa-na-aš*, *e-eš-na-aš*	**H₁əsH₂nás*	**H₁əsH₂nós*
Dative-Locative	*e-eš-ḫa-ni-i*, *iš-ḫa-ni(-i)*	**H₁əsH₂ní*	**H₁əsH₂ní ~ *H₁əsH₂néy / *H₁ₑsH₂nóy*
Ablative (sg./pl.)	*e-eš-ḫa-na-az*, *iš-ḫa-na-az*, *e-eš-ḫa-na-az*, *iš-ḫa-na-an-za*	**H₁əsH₂nátʰs*	**H₁əsH₂nótʰs* **H₁əsH₂nóntʰs*
Instrumental (sg./pl.)	*e-eš-ḫa-an-ta*, *iš-ḫa-an-da*, *e-eš-ḫa-ni-it*	**H₁əsH₂án(tʰ)* **H₁əsH₂nét*	**H₁əsH₂ón(tʰ)* **H₁əsH₂nétʰ*

Plural (unattested):

Cognates:

A. Anatolian: Cuneiform Luwian (nom.-acc. sg.) *a-aš-ḫar-ša*, [*a*]*aš-ḫa-ar* ‘blood’. (adj.; nom. sg. c.) *a-aš-ḫa-nu-wa-an-ti-iš* ‘bloody’; Hieroglyphic Luwian (n.; nom.-acc. sg.) *á-sa-ha-na-ti-sa-za* ‘blood-offering’
B. Other: Sanskrit (nom.-acc. sg.) *ásṛk* ‘blood’, (gen. sg.) *asnás*; Tocharian A *ysār* ‘blood’, B *yasar* ‘blood’; Greek ἔαρ ‘blood’; Latin *assyr*, *aser* ‘blood’; Latvian *asins* ‘blood’; Armenian *ariwn* ‘blood’.

Kloekhorst 2008a:256—260 Proto-Indo-European (nom.-acc. sg.) **h₁ésh₂r*, (gen.sg.) **h₁sh₂éns* (> Pre-Hittite **h₁esh₂enós*) — Kloekhorst argues convincingly that a reconstruction *h₁ḗsh₂r*, with a long vowel in the first syllable, is not justified; Puhvel 1984— .1/2:305—313 Proto-Indo-European (nom.-acc. sg.) **ḗsH₁r̥*, (gen.sg.) **ésH₁-n̥-s*; Tischler 1977— .I:112—115; Friedrich 1991:43; Sturtevant 1936:37, 1942:§47b, §59b, §66b, and 1951:§56, §65, §75, §87 Proto-Indo-Hittite **Eésγʙr*, §141 — according to Sturtevant, the instrumental plural in *-an-ta* is an analogical reformation, while “the commoner instrumental ending *-it* must be interpreted as standing for *-et*”; Pokorny 1959:343 **ĕs-r̥(gʷ)*. ‘blood’ (gen.) **ₑs-n-és*; Walde 1927—1932.I:162 **ĕs-r̥(gʷ)* blood’, (gen.) **ₑs-n-és*, **sₑnés*; Mann 1984—1987:249—250 **esˀər* ‘blood; tears; sweat; lymph’, (gen. sg. or poss.) **esˀnos* — Mann notes: “The ultimate phonology of this word-type is entirely obscure.”; Buck 1949:§4.15 blood; Mallory—Adams 1997:71 **h₁ésh₂r̥-* (nom. **h₁ésh₂ōr*) ‘(flowing) blood’, (gen.) **h₁ₑsh₂nós* — Mallory—Adams note: “Its geographical spread (including Anatolian) and archaic morphology ensure PIE status.”; Mayrhofer 1956—1980.I:66 “old heteroclitic”; Uhlenbeck 1898—1899.1:18; Burrow 1973:221; Martirosyan 2010:138 **h₁esh₂r* > **ehar* > **ar-+-iwn*; Beekes 2010.I:366 **h₁esh₂-r*; Frisk 1970—1973.I:432; Hofmann 1966:66; Chantraine 1968—1980.I:308; De Vaan 2008:58 Proto-Indo-European (nom.-acc. sg.) **h₁ésh₂-r*, (gen. sg.) **h₁sh₂-én-s*;

Walde—Hofmann 1965—1972.I:72 **ĕsr̥g*, (gen.) **ₑsnés*; Ernout—Meillet 2001:52; Adams 2013:525 **h₁ésh₂ōr*; Van Windekens 1976—1982.I:607 **esōr*; Bomhard 2023.1:832 (comparison with Northwest Caucasian) Proto-Indo-European (nom.-acc. sg.) **ʔés-ḫ͡ḫ-r̥*; (gen. sg.) **ʔs-ḫ͡ḫ-én-s*, **ʔs-ḫ͡ḫn-és*.

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4. *iš-ḫa-aš* ‘master, lord, owner’ (common gender *a*-stem; mobile accent; with initial *i-* (< *e-*) generalized throughout the paradigm. According to Kloekhorst 2008a:390: “The rare spellings with initial *e-eš-ḫ*° or *eš-ḫ*° are all NS…”):

Singular:	Hitttite	Indo-Anatolian	Indo-European
Nominative	*iš-ḫa-a-aš*, *iš-ḫa-aš*	**H₁ésH₂as*	**H₁ésH₂os*
Accusative	*iš-ḫa-a-an*	**H₁ésH₂am*	**H₁ésH₂om*
Vocative (no accent)	*iš-ḫa-a*, *iš-ḫa*	**H₁esH₂a*	**H₁esH₂o*
Genitive	*iš-ḫa-a-aš*	**H₁əsH₂ás*	**H₁əsH₂ós*
Dative-Locative	*iš-ḫi-i=š-ši*, *iš-ḫi-e=š-ši*, *iš-ḫi-i*, *eš-ḫé*	**H₁əsH₂í* ~ **H₁əsH₂éy*	**H₁əsH₂í* ~ **H₁əsH₂éy* / **H₁əsH₂óy*
Ablative (sg./pl.)			
Instrumental (sg./pl.)			
Allative / Directive			
Plural:			
Nominative	*iš-ḫe-e-eš* *iš-ḫé-eš*	**H₁ésH₂es*	**H₁ésH₂es*
Accusative	EN-MEŠ-*uš*	**H₁ésH₂m̥s*	**H₁ésH₂m̥s*
Genitive	*iš-ḫa-a-aš*	**H₁əsH₂ás*	**H₁əsH₂ós*
Dative-Locative	*iš-ḫa-aš*	**H₁əsH₂ás*	**H₁əsH₂ós*

Cognates:
A. Anatolian: No known Anatolian cognates.
B. Other: Latin *erus* ‘the master of a house or family; master, lord, owner, proprietor’.

Note: This etymology is rejected by Puhvel 1984— .1/2:385—390. He cautiously favors comparison with Armenian *išxan* ‘ruler, prince’, *išxel* ‘to rule’ instead, as “[e]ither a borrowing from Hittite into Armenian or into both from some common ‘culture word’ source…”

Kloekhorst 2008a:390 Proto-Indo-European **h₁esh₂-ó-*; Puhvel 1984— .1/2:385—390; Tischler 1977— .I:372—377; Friedrich 1991:85; Sturtevant 1936:37, under *eshās*, 1942:§56a, Proto-Indo-Hittite **’esḪos*, and 1951:§47, §58, §87, §121; Pokorny 1959:342; Walde 1927—1932.I:161; Buck 1949:1329—1332, §19.41 master; Mallory—Adams 1997:371—372 Proto-Indo-European ? **h₁esh₂ós* ‘master’; De Vaan 2008:194—195 Proto-Indo-European **h₁esh₂-ó-* ‘master’; Walde—Hofmann 1965—1972.I:419; Ernout—Meillet 2001:201—202.

The Old Hittite case endings may be summarized as follows (cf. Hoffner—Melchert 2008:69—78, noun and adjective declensions 79—131; Beckman 2011:524; Van den Hout 2011:17; Sturtevant 1951:84—91; Kloekhorst 2008a:104—105; Friedrich 1960:42—45; Lauffenburger 2008:23; Luraghi 1997:15; Rieken 2011:45; Yakubovich 2020:229; Watkins 2004:560—561; Neu 1979:178):

	Singular	Plural
Nominative, common	*-š*, *-Ø*	*-eš*
Accusative	*-n, -an*	*-uš*
Nominative-accusative, neuter	*-Ø*, *-an*, *-n*	*-Ø*, *-a*
Vocative	*-i*, *-Ø*	
Ergative	*-anza* (/-ants/)	*-anteš*
Genitive	*-aš*	*-an*, *-aš*
Dative-locative	*-i*, *-ya*, *-Ø*	*-aš*
Allative	*-a*	
	Singular/Plural	
Ablative	*-az*, *-za* (/-ts/)	
Instrumental	*V-t*, *C-it*, *-d/ta*	

As noted by Kloekhorst (2013), Late Proto-Indo-European noun stems could be classified into four basic types according to their accent-Ablaut patterns: (1) acrostatic, (2) proterokinetic, (3) hysterokinetic, and (4) amphikinetic, as follows (R = Root; S = Suffix; E = Ending):

1. Acrostatic

	R	S	E
Strong	*é/ó*	-	-
Weak	*é*	-	-
Loc.	*é*	-	

2. Proterokinetic

	R	S	E
Strong	*é*	-	-
Weak	-	*é*	-
Loc.	-	*é*	

3. Hysterokinetic

	R	S	E
Strong	-	*é*	-
Weak	-	-	*é*
Loc.	-	*é*	*(-i)*

4. Amphikinetic

	R	S	E
Strong	*é*	*o*	-
Weak	-	-	*é*
Loc.	-	*é*	*(-i)*

Szemerényi (1996:162) adds a fifth type:

5. Mesostatic: the accent is on the suffix throughout the paradigm.

An even more elaborate system is set up by Meier-Brügger (2003:205—218) — see also Fortson 2010:§§6.19—6.28; Clackson 2007:79—86.

Kloekhorst (2013:124) concludes that this model does not accurately reflect the noun stem patterning found in an earlier stage of development. Rather, Kloekhorst posits a model

consisting of only three accent-Ablaut patterns for the earlier stage: (1) static, (2) protero-dynamic, and (3) hysterodynamic. He posits the following original hysterodynamic stem patterning:

*CéC-C ~ *CC-éC-m ~ *CC-C-és

He derives the later hysterokinetic and amphikinetic stem patterning from the earlier hysterodynamic stem patterning. In this theory, it is assumed that the morphologically significant vowel was always **e*. However, as rightly pointed out by Clackson (2007:86):

> It is possible that both Greek and Sanskrit made the same innovatory change in the accent pattern of the word for 'foot' when they replaced the inherited paradigm, following their separation from PIE. However, other comparative evidence makes it likely that, at the later stages of PIE, the hypothesis that each word has only one **e* vowel which was positioned in the locus of the accent cannot be true. We have already seen cases where the vowel **o* can also stand in accented syllables in opposition to **e*, as in the very same paradigm, nominative **pód-s* and genitive **péd-s*. There are also roots and suffixes which always show **o* and never **e* in any language, such as **póti-* 'master'; reconstructed words which show two *e*-grades, such as **pénk^{w}e* 'five'; and words where the comparative evidence suggests that the location of the accent was other than where the vowel **e* stood, as **septḿ* 'seven' and **wóid-e* 'he/she knows'.

Building upon Kloekhorst's views, it appears that the earliest noun paradigm patterning for neuter action nouns was based upon the following dynamic relationship between accent-Ablaut and case endings: in neuter action nouns, the accent was placed on the root in the so-called "strong" cases, which also had a full-grade vowel (**CV́C-C-*), while the vowels of the suffix and inflectional ending were either reduced (= reduced-grade) or eliminated altogether (= zero-grade), unless the loss of the vowel would have resulted in unpronounceable consonant clusters or would have obscured the form and meaning of the case ending. In the so-called "weak" cases (= "oblique" cases), the accent was shifted from the root to either the suffix or the inflectional ending, which had a full-grade vowel, while the vowel of the root was either reduced or eliminated altogether, unless the loss of the vowel would have resulted in unpronounceable consonant clusters. The accent was always shifted to the inflectional ending in the weak cases when one existed. When no inflectional ending was present, the accent was shifted to the suffix in the weak cases instead, thus:

1. Strong cases: *CV́C-C-;
2. Weak cases, with case ending: *CC-C-V́(C) / *CC-C-CV́(C);
3. Weak cases, without case ending: *CC-V́C-Ø.

It was the interplay of this patterning with the developing system of indicating grammatical relationships mainly by means of case endings that resulted in the accent-Ablaut patterns reconstructed above. Earlier, there were fewer case endings, and the morphological relationships at issue were indicated by means of postpositions and word order (SOV) combined with the accent-Ablaut rules just mentioned. It should be noted that the earlier

accent-Ablaut patterns became somewhat obscured in the daughter languages by the leveling out of the patterning in favor of fixed position throughout the paradigm.

For comparison, the Disintegrating Indo-European system of case endings has been reconstructed as follows (cf. Bomhard 2023.I:521—522; Adrados—Bernabé—Mendoza 1995—1998.II:45—94; Beekes 2011:185—217; Brugmann 1904:373—399; Clackson 2007:92—100; Fortson 2010:113—139; Fulk 2018:141—180; Gray 1932; Hirt 1921—1927.3:33—81; Meier-Brügger 2003:195—199; Meillet 1964:292—300; Lundquist—Yates 2018:2083; Pooth 2014; Schmalstieg 1980:46—87; Sihler 1995:248—256; Schmitt-Brandt 1998:180—220; Shields 1982; Szemerényi 1996:157—192; Watkins 1998:65—66) (the following table is a composite drawn from multiple sources and aims to be as comprehensive as possible; some of the reconstructions are more certain than others — the dual endings are particularly uncertain):

Case	Singular	Plural	Dual
Nominative	*-*s*, *-*Ø*	*-*es*	} *-$H_1(e)$
Vocative	*-*Ø*	*-*es*	
Accusative	*-*m*/*-*m̥*	*-*m̥s*/*-*ms* or *-*n̥s*/*-*ns*	
Genitive	*-*es*/*-*os*/*-*s*	*-*om*/*-*ōm*	*-*ows* (?), *-*oH_1s* (?)
Ablative	*-*es*/*-*os*/*-*s*; *-*ēt^h*/*-*ōt^h* (< *-*e/o-H_1(e)t^h*)	*-*b^h(y)os*, *-*mos*	*-*b^{h}yō* (?), *-*mō* (?)
Dative	*-*ey*	*-*b^h(y)os*, *-*mos*	*-*b^{h}yō* (?), *-*mō* (?)
Locative	*-*i*, *-*Ø*	*-*su*/*-*si*	*-*ow* (?)
Instrumental	*-*(e)H_1*	*-*b^{h}is*, *-*mis*	*-*b^{h}yō* (?), *-*mō* (?)

Missing from this table is the thematic nominative-accusative neuter singular ending *-*m* — this form is to be derived from the accusative singular ending. The *-*b^h*- and *-*m*- endings found in several of the concrete cases are usually considered to be late additions, and some have even questioned whether they should even be posited for the Indo-European parent language. They are not found in Hittite or the other Anatolian daughter languages. No doubt, these endings were originally postpositions that were gradually incorporated into the case system, with some daughter languages choosing *-*b^h*- and others choosing *-*m*-. They probably should not be reconstructed as case endings at the Proto-Indo-European level. In like manner, the genitive plural probably arose from the accusative singular, while the genitive singular and nominative singular endings in *-*s* must have had a common origin — these endings later spread from the genitive singular to the ablative singular. The dual was a late addition, while the plural originally had a reduced set of endings compared to what was found in the singular — this is the picture that emerges when the Hittite and other Anatolian data are brought into consideration (see above for details). We may note here that the Proto-Uralic ablative ending *-*ta* and the Proto-Elamo-Dravidian oblique/locative ending *-*tə* are most likely related to the Anatolian instrumental singular endings

within Indo-Anatolian: Hittite *-it*, *-et*, (rare) *-d/ta*; Palaic *-az*; Luwian *-ati*; Lycian *-adi*, *-edi*; Lydian *-ad* (cf. Bomhard 2023.I:438—440).

The rules governing the position of the accent in Proto-Indo-Anatolian may be stated rather simply:

1. As indicated above, neuter action nouns were accented on the stem in the so-called "strong" cases but on the case ending in the so-called "weak" cases (cf. Burrow 1973: 220—226).
2. Common gender agent noun/adjectives were accented on the suffix throughout the paradigm (cf. Burrow 1973:119).
3. Athematic verbs were accented on the stem in the singular but on the ending in the plural (and dual) in the indicative but on the ending throughout the middle (cf. Burrow 1973:303). Note: The dual was a post-Anatolian development.

The thematic formations require special comment. It seems that thematic agent noun/adjectives were originally accented on the ending in the strong cases and on the stem in the weak cases. This pattern is the exact opposite of what is found in the neuter action nouns. The original form of the nominative singular consisted of the accented thematic vowel alone. It is this ending that is still found in the vocative singular in the daughter languages and in relic forms such as the word for the number 'five', **$p^{h}enk^{wh}e$* (**$per̥q^{u}e$* in Brugmann's transcription). The nominative singular in **-os* is a later formation and has the same origin as the genitive singular (cf. Szemerényi 1972a:156; Van Wijk 1902).

The system of accentuation found in Disintegrating Indo-European was by no means ancient. The earliest period of Proto-Indo-European that can be reconstructed appears to have been characterized by a strong stress accent (cf. Burrow 1973:108—112; Lehmann 1952:111—112, §15.4, and 1993:131—132; Szemerényi 1996:111—113) — following Lehmann, this period may be called the Phonemic Stress Stage, or, in more current terms, Proto-Indo-Anatolian. This accent caused the weakening and/or loss of the vowels of unaccented syllables. There was a contrast between those syllables with stress and those syllables without stress. Stress was used as an internal grammatical morpheme, the stressed syllable being the morphologically distinctive syllable. The phonemicization of a strong stress accent in Pre-Indo-Anatolian caused a major restructuring of the inherited vowel system and brought about the development of syllabic liquids and nasals (cf. Lehmann 1993:138).

In the latest period of Proto-Indo-European, quantitative Ablaut was no longer a productive process. Had there been a strong stress accent at this time, each Proto-Indo-European word could have had only one syllable with full-grade vowel, the vowels of the unstressed syllables having all been reduced or eliminated. However, since the majority of reconstructed Proto-Indo-European words have more than one full-grade vowel, the stress accent must have become non-distinctive at some point prior to the latest stage of development.

In closing, we may quote Pooth 2020:24:

> …the idea that Proto-Indo-European morphology was completely identical to the one of Ancient Greek and Vedic Sanskrit is rather unlikely in my view…

The evidence from the Anatolian daughter languages requires a thorough reassessment of the traditional reconstruction, especially for the earlier stages of development.

Selected Hittite Verb Conjugations:

A. *-mi* Conjugation:

1. *e-eš-* 'to be':

Present Active Singular		Indo-Anatolian	Indo-European
1.	*e-eš-mi*	*H_1ás-m-i	*H_1és-m-i
2.	*e-eš-ši*, *e-eš-ti* (*-ti* = *-te*)	*H_1ás-s-i, *H_1ás-t^h-ə	*H_1és-s-i
3.	*e-eš-zi*, *i-eš-zi*	*H_1ás-t^h-i	*H_1és-t^h-i
Plural			
1.	*e-šu-wa-ni*	*H_1əs-wá-n-i	[*H_1(ə)s-mé-n/s-i]
2.			
3.	*a-ša-an-zi*	*H_1əs-án-t^h-i	[*H_1(ə)s-én-t^h-i, *H_1(ə)s-ón-t^h-i]
Preterite Active Singular			
1.	*e-šu-un*	*H_1ás-m̥	*H_1és-m̥
2.	*e-eš-ta*	*H_1ás-t^h	[*H_1és-s]
3.	*e-eš-ta*	*H_1ás-t^h	*H_1és-t^h
Plural			
1.	*e-šu-u-en*, *e-šu-en*, *e-eš-šu-u-en*	*H_1əs-wá-n	[*H_1(ə)s-mé-n/s]
2.	*e-eš-te-en*	*H_1əs-t^há-n	*H_1(ə)s-t^hé-n/s
3.	*e-še-er*, *e-šer*, *e-še-ir*	*H_1əs-ár	[*H_1(ə)s-én-t^h, *H_1(ə)s-ón-t^h]

Notes:

1. The 2nd sg. pres. act. (OH?/NS) *e-eš-ti* can only represent an archaic form in *-*te* (cf. 2nd pl. pret. act. *e-eš-te-en*). As noted by Kloekhorst (2008a:251—252), had this ending been *-*ti*, with **i*, it would have yielded Hittite *-zi*, with affricativization of *t* before *i* as in the 3rd sg. pres. act. *e-eš-zi*.

2. There was a change of accent and ablaut in this and other athematic stems in Proto-Indo-Anatolian — in the singular, the stem had full-grade vowel and was accented, while, in the plural, the stem had zero-grade vowel, and the accent was shifted to the ending.
3. The *e*-grade in the plural in Hittite is due to analogy.

Cognates:

A. Anatolian: Palaic (2nd sg. imp. act.) *a-aš*, (3rd sg. imp. act.) *a-aš-du*, (3rd pl. imp. act. *a-ša-an-du*, *a-še-en-du*; Cuneiform Luwian (3rd sg. pres. act.) *a-aš-ti*, (1st sg. pret. act.) *aš-ḫa* (?), (3rd sg. pret. act.) *a-aš-ta*, (3rd sg. imp.) *a-aš-du*, (3rd pl. imp.) *a-ša-an-du*; Hieroglyphic Luwian (3rd sg. pres. act.) *a-sa-ti*, (2nd pl. pres. act.) *a-sa-ta-ni*, (3rd pl. pres. act.) *á-sa-ti*; (1st sg. pret. act.) *á-sa-ha*, *á-sá-ha*, *á-sa-ha-'*, *á-sa$_8$-ha*, (3rd sg. pret. act.) *á-sa-ta*, *á-sa-tá*, *á-sa-ta-'*, *sa-ta*, *a-sa-tá*, *sa-tá-'*, *sa-ta*; Lydian (1st sg. pres.) *-im*; Lycian (3rd sg. pres. act.) *esi*, (3rd sg. imp. act.) *esu*.
B. Other: Sanskrit (1st sg. pres.) *ásmi*, (2nd sg. pres.) *ási* (instead of **ássi*), (3rd sg. pres.) *ásti*, (1st pl. pres.) *smás*, (2nd pl. pres.) *sthá*, (3rd pl. pres.) *sánti*; Greek (1st sg. pres) εἰμί, (2nd sg. pres.) εἶ, (3rd sg. pres.) ἐστί; Latin (3rd sg. pres.) *est*, (3rd pl. pres.) *sunt*; Gothic (1st sg. pres.) *im*, (2nd sg. pres.) *is*, (3rd sg. pres.) *ist*, (1st pl. pres.) *sijum*, (2nd pl. pres.) *sijuþ*, (3rd pl. pres.) *sind*; Old Icelandic (1st sg. pres.) *em*, (2nd sg. pres.) *ert*, (3rd sg. pres.) *er*, (1st pl. pres.) *erum*, (2nd pl. pres.) *eruð*, (3rd pl. pres.) *eru*; Old Swedish (1st sg. pres.) *æm*, (2nd sg. pres.) *æst*, (3rd sg. pres.) *is*; Old English (West Saxon) *bēon* ‘to be’: (1st sg. pres.) *eom*, (2nd sg. pres.) *eart*, (3rd sg. pres.) *is*, (pl.) *sint*, *sindon*; Old Frisian (3rd sg. pres.) *is*; Old Saxon (3rd sg. pres.) *ist*; Dutch (3rd sg. pres.) *is*; Old High German (3rd sg. pres.) *ist*; Old Irish (1st sg. pres.) *am* (< **esmi*), (2nd sg. pres.) *at*, (3rd sg. pres.) *is* (< **esti*), (1st pl. pres.) *ammi* (< **esm-*), (2nd pl. pres.) *adib*, (3rd pl. pres.) *it* (< **senti*); Old Welsh (3rd sg. pres.) *is*; Old Breton (3rd sg. pres.) *is*; Gaulish (1st sg. pres.) *immi*; Lithuanian (1st sg. pres.) *esmì*, (2nd sg. pres.) *esì*, (3rd sg. pres.) *ẽsti* (*èsti*), (1st pl. pres.) *ẽsme* (*èsme*), (2nd pl. pres.) *ẽste* (*èste*); Old Prussian (1st sg. pres.) *asmai*, *asmu*, *asmau*, (2nd sg. pres.) *assai*, *assei*, *asse*, (3rd sg. pres.) *ast*, (1st pl. pres.) *asmai*, (2nd pl. pres.) *asti*, *estei*, *astei*; Old Church Slavic (1st sg. pres.) *jesmь*, (2nd sg. pres.) *jesi*, (3rd sg. pres.) *jestъ*, (1st pl. pres.) *jesmъ*, (2nd pl. pres.) *jeste*, (3rd pl. pres.) *sątъ*; Armenian (1st sg. pres.) *em*, (2nd sg. pres.) *es*, (3rd sg. pres.) *ē*; Albanian (1st sg. pres.) *jam*, (2nd sg. pres.) *je*, (3rd sg. pres.) *është*.

Kloekhorst 2008a:250—252 Proto-Indo-European **h$_1$és-ti*, **h$_1$s-énti* — according to Kloekhorst, the spelling (3rd sg. pres. act.) *i-eš-zi* is a scribal error; Friedrich 1991:42; Puhvel 1984— .1/2:285—291; Tischler 1977— .I:109—110; Sturtevant 1936:36 and 1951:149, §299; Gusmani 1980—1982:58 *-im* < **esmi*; Melchert 1993a:20 and 1993b:33; Laroche 1959:32—33; Carruba 1970:52; Pokorny 1959:340—342 **es-*; Walde 1927—1932.I:160—161 **es-*; Mann 1984—1987:250 **esmi* (**es-si*, **es-ti*) ‘am’ and 253 **esti* ‘is’; Rix 2001:241—242 **h$_1$es-*; Buck 1949:§9.91 — according to Buck, “Words for ‘be’, denoting existence and serving as the copula, are mostly derived from two roots, of which one (**es-*) was the most colorless, while the other (**bheu-*, **bhū-*) evidently had the primary sense of ‘come into being, become’.”; Mallory—Adams 1997:53 **h$_1$es-* ‘be’; Mayrhofer 1956—1980.I:67; Uhlenbeck 1898—1899.1:18—19; Martirosyan 2010:255

$h_1$es-mi, *$h_1$es-si*, *$h_1$es-ti*, (3rd pl. pres.) *h_1s-énti*; Beekes 2010.I:389 *$h_1$es-*; Frisk 1970—1973.I:463—464; Hofmann 1966:73; Chantraine 1968—1980.I:322—323 root *es- "old athematic present root, with vowel alternation"; De Vaan 2008:599 *$h_1$es-/*h_1s- 'to be'; Ernout—Meillet 2001:665—666; Walde—Hofmann 1965—1972.II:628—629; Kroonen 2013:582 *$h_1$es- 'to be'; Orël 2003:458; Schuhmann 2024:161, no. 462, *$h_1$es-ti*; Feist 1939:292 *esmi*, *es(s)i*, *esti*; Lehmann 1986:205 *es- ← *ʔes-; Uhlenbeck 1900:89 and 142 under *sunja* 'true': *es-; De Vries 1977:101; Weekley 1921:129; Klein 1971:58 *esmi* and 816 *es-ti*; Onions 1966:81 *es-, *s- and 846 under *sooth*; Boutkan—Siebinga 2005:195 *$h_1$esti*; Vercoullie 1898:121; Kluge—Seebold 2011:451 *esti* and 840 under *sein*; Walshe 1951:208 under *sein*; Smoczyński 2007:149 under *esù*: *$h_1$es-mi*, *-si*, *-ti*; Fraenkel 1962—1965.I:124; Derksen 2008:146 *$h_1$es-mi*, *$h_1$es-ti* and 2015:157 *$h_1$es-mi*, *$h_1$es-ti*; Orël 1998:156 *es-; Huld 1984:76—77 *E_1esmi*; Meyer 1891:160—161 *ésmi*; Matasović 2009:118 **$h_1$es-.

2. *ku-en-* 'to strike, to smite, to slay, to kill':

Present Active Singular		Indo-Anatolian	Indo-European
1.	*ku-e-mi*	*$g^wə́n$-m-i	*g^{wh}én-m-i
2.	*ku-e-ši*, *ku-en-ti* (*-ti* = *-te*)	*$g^wə́n$-s-i,	*g^{wh}én-s-i
	ku-e-ti	*$g^wə́n$-t^h-ə	
3.	*ku-(e-)en-zi*	*$g^wə́n$-t^h-i	*g^{wh}én-t^h-i
Plural			
1.			
2.			
3.	*ku-na-an-zi*	*g^wn-án-t^h-i	*g^{wh}n-ón-t^h-i
Preterite Active Singular			
1.	*ku-e-nu-un*	*$g^wə́n$-m̥	*g^{wh}én-m̥
2.	*ku-en-ta*	*$g^wə́n$-t^h	[*g^{wh}én-s]
3.	*ku-(e-)en-ta*	*$g^wə́n$-t^h	*g^{wh}én-t^h
Plural			
1.	*ku-e-u-en*	*g^wn̥-wə́-n	[*g^{wh}n̥-mé-n/s]
2.	*ku-en-tin*	*g^wn̥-t^hə́-n	*g^{wh}n̥-t^hé-n/s
3.	*ku-e-nir*, *ku-e-ni-ir*	*g^wn-ə́r	[*g^{wh}n-én-t^h, *g^{wh}n-ón-t^h]

Cognates:

A. Anatolian: (?) Lydian, *qēn-* (*qān-*) verb root in *ucbaqēn-* and *fisqān-*.
B. Other: Sanskrit (3rd sg. pres.) *hánti* ‘to strike, to kill, to slay’, (3rd pl. pres.) *ghnánti*; Avestan *ǰaiṇti* ‘to strike, to slay, to kill’; Greek θείνω ‘to strike; to slay, to kill’, φατός ‘slain’, φόνος ‘murder, manslaughter’; Armenian *gan* ‘beating, blow’; Latin *-fendō* in *dē-fendō* ‘to repel, to repulse, to ward off, to drive away’, *of-fendō* ‘to strike, to knock, to dash against’; also *īn-fēnsus* ‘hostile, aggressive’; Old Irish *gon(a)id* ‘to wound, to slay’; Burgundian **gunþs* ‘fight’; Old Icelandic *gunnr*, *guðr* ‘war, battle’; Old Saxon *gūdea* ‘battle’, *gūth-* ‘battle’ in: *gūthfano* ‘regimental colors’, *gūthhamo* ‘*armor’*; Old English *gūð* ‘combat, battle, war’; Old High German *gund-* ‘battle’; Lithuanian *genù*, *giñti* ‘to drive, to propel’, *geniù*, *genėti* ‘to lop, to trim, to prune (tree, branches)’, *ginù*, *gìnti* ‘to defend, to protect; to forbid, to prohibit’, *ganaũ*, *ganýti* ‘to graze, to pasture; to herd, to tend (the cattle)’; Latvian *dzenēju*, *dzenêt* ‘to trim, to prune’, *dzęnu*, *dzìt* ‘to chase, to drive, to persecute’; Old Prussian *guntwei* ‘to chase, to drive’; Old Church Slavic *ženǫ*, *gъnati* ‘to chase, to persecute’, *gonjǫ*, *goniti* ‘to chase, to drive’; Czech *hnáti* ‘to chase, to drive, to compel’, *hon* ‘hunt’, *honiti* ‘to chase, to hunt, to persecute’; Polish *gonić* ‘to chase, to hunt, to persecute’; Slovakian *honit′* ‘to chase, to hunt, to persecute’; Serbo-Croatian *gònim*, *gòniti* ‘to chase, to persecute’; Bulgarian *gónja* ‘to chase, to hunt, to persecute’; Slovenian *gọ́nim*, *góniti* ‘to drive repeatedly’; Russian *gnat′* [гнать] ‘to drive, to drive away, to turn out, to chase, to chase away; to urge, to thrust, to jostle, to hustle, to shove, to jog, to jolt’, (dial.) *gonít′* [гонить] ‘to persecute, to oppress’.

Kloekhorst 2008a:485—486 Proto-Indo-European **g^{wh}én-ti*/**g^{wh}n-énti*, **g^{wh}n-ské/ó-*; Puhvel 1984— .4:206—212 **gh^{w}en-*; Friedrich 1991:112—113 Proto-Indo-European **g$^{u̯}$hen-*; Tischler 1977— .I/4:604—606; Sturtevant 1936:87 and 1951:38, §62a, Indo-Hittite **g^{ʕ}wénty*, **g^{ʕ}wnénty* and 58, §81; Gusmani 1980—1982:83; Pokorny 1959:491—493 **g$^{u̯}$hen-(ə)-* ‘to strike, to hit’; Walde 1927—1932.I:679—681 **g$^{u̯}$hen-*, also as a seṭ-base **g$^{u̯}$henē-*; Mann 1984—1987:379—380 **g$^{u̯}$hen-* ‘to drive, to beat, to kill’; Mallory—Adams 1997:548 **g^{w}hen-* ‘to strike’ (pres. **g^{w}hénti*): “Practically universally attested and clearly old in IE, this is the archetypal verb for ‘strike’ in PIE.”; Rix 2001:218—219 **g$^{u̯h}$en-*; Buck 1949:§9.21 strike (hit, beat) **g^{w}hen-*; Watkins 2000:35 **g^{w}hen-* ‘to strike, to kill’; Mayrhofer 1956—1980.III:575—577; Uhlenbeck 1898—1899.2:357; Boisacq 1950:336 **g$^{u̯}$hen-i̯ō*, **g$^{u̯}$hono-s*, **g$^{u̯}$hn̥-*; Chantraine 1968—1980.I:425—426 **gh^{w}en-*; Frisk 1970—1973.I:657—658 **g$^{u̯}$hen-*; Beekes 2010.I:536—537 **g^{wh}en-* and II:1586 **g^{wh}on-o-*; Hofmann 1966:112 **g$^{u̯}$hen-i̯ō*; Martirosyan 2010:198; Hübschman 1883:24; De Vaan 2008:210—211 **g^{wh}en-d^{h}-* ‘to hit, to strike’; Ernout—Meillet 2001:224—225 **gh^{w}en-*; Walde—Hofmann 1965—1972.I:332—333 **g$^{u̯}$hen-* and I:478; Matasović 2009:144 **g^{wh}en-*; Kroonen 2013:196 **g^{wh}én-ti*; Orël 2003:146 Proto-Germanic **ɣunþz*; De Vries 1977:195 Proto-Norse **gunþʀ*; Smoczyński 2007:156—157, 169, 180—181, 181; Derksen 2008:177, 197 **g^{wh}on-* and 2015:170—171**g^{wh}en-*, 177, 177—178; Fraenkel 1962—1965.I:152—153.

B. *-ḫi* Conjugation:

3. *a-ar-* ‘to come (to), to arrive (at)’:

Present Active Singular		Indo-Anatolian	Indo-European
1.	*a-ar-ḫi* (*-ḫi* < *-*H*₂á+i*)	**H*₁*ar-H*₂*á*	**H*₁*or-H*₂*á*
2.	*a-ar-ti* (*-ti* < *-*t*ʰə́+i*)	**H*₁*ar-t*ʰə́*	**H*₁*or-t*ʰ*(e)+(H*₂*á)*
3.	*a-ri* (*-i* < *-*ə́+i*)	**H*₁*ar-ə́*	**H*₁*or-é*

Note: As pointed out by Sturtevant (1951:131—132, §231), the Hittite 1st singular ending in *-(ḫ)ḫi* resulted from the spread of final *-i* to the present active ending. The original ending here was *-(ḫ)ḫa*, which is still preserved in Luwian and Lycian: cf. Cuneiform Luwian (1st sg. pret.) *ta-pár-ḫa*, *da-pár-ḫa* ‘I ruled, I governed’, *a-ḫa* ‘I made, I did’, *ú-i-ši-ḫa* ‘I pressed, I squeezed’; Hieroglyphic Luwian (1st sg. pret.) *á-ha* ‘I made, I did’, *á-sa-ha*, *á-sá-ha* ‘I sat’, *i-zi-i-ha* ‘I made’, *pi-ia-ha* ‘I gave’, *(X)su-wa/i-ha* ‘I filled’, *ta-ma-ha* ‘I built’; Lycian (1st sg. pret.) *aχa*, *aχã*, *agã* ‘I made, I did’, (1st sg. pret.) *pijaχa*, *pijaχã* ‘I gave’, *prñnawaχã* ‘I built’. The final *-i* has spread to the other *-ḫi* conjugation present active endings in Hittite as well.

Plural

1.	*e-ir-u-e-ni*, *e-ru-(u-)e-ni*	[**H*₁*ə́r-wə-n-i*]
2.	*(a-)ar-te-ni*, *e-ir-te-ni*	[**H*₁*ə́r-t*ʰ*ə-n-i*]
3.	*a-ra-an-zi*	[**H*₁*ár-an-t*ʰ*-i*]

Notes:

1. In Hittite, the patterning here appears to have been accent on the ending in the singular, and with full-grade vowel in the root, but on the stem in the plural (cf. Hart 1980:57—58) — this was the exact opposite of the patterning found in the *-mi* conjugation. Exceptions to this patterning can be explained as the beginnings of the shift in accent to conform with the patterning found in the *-mi* conjugation. This shift was completed in the non-Anatolian daughter languages, where the accent was the same as in the *-mi* conjugation, that is, on the stem, which was in *o*-grade, in the singular but on the ending, with stem in reduced-grade, in the plural. The non-Anatolian daughter languages also have introduced reduplication into the majority of stems here. The original patterning seems to have been accent on the ending throughout the paradigm (both singular and plural).
2. All of the present active plural personal endings of the Hittite *-ḫi* conjugation were taken over from the *-mi* conjugation.

Preterite Active
Singular

1. *(a-)-ar-aḫ-ḫu-un*,
   (a-)ar-ḫu-un
2.
3. *a-ar-aš*, *a-ar-ta*

Plural

1. *e-ru-u-en*, *e-ir-u-en*
2. *a-ar-tin*, *ir-te-in*
3. *e-ri-(e-)ir*, *i-e-ri-ir* [**H₁ár-ər*] (< **H₁ər-ár*) **H₁er-ér*

Notes:
1. As noted above, Hittite has replaced all of the present active plural endings with those of the *-mi* conjugation. The same has happened for all of the singular preterite active personal endings and for the 1st and 2nd person plural preterite active endings. Here, only the 3rd plural preterite active personal ending is original.
2. Hittite has repurposed the *-ḫi* conjugation into an alternative to the *-mi* conjugation (cf. Patri 2020:209) — that is, same function, slightly different endings (see note 1 above). This represents a Hittite-specific innovation.
3. Primarily on the basis of a comparison of the non-Anatolian daughter languages, the earliest stative personal endings (> Hittite *-ḫi* conjugation singular personal endings, see above, note 1 above) were most likely as follows (cf. Lehmann 2002:171; Kortlandt 2007b:22 — Kortlandt writes **q₂* for **H₂*; Bomhard 2023.1:643 and 1:648):

Person	Endings
1st sg.	**-H₂a*
2nd sg.	**-tʰe*; later **-tʰH₂a* (< **-tʰ(e)*+**-H₂a*)
3rd sg.	**-e*
1st pl.	**-me-* (?)
2nd pl.	**-e*
3rd pl.	**-ēr*, **-r̥s*

4. The **-H₂a* found in the 2nd singular personal ending (**-tʰH₂a* < **-tʰ(e)*+**-H₂a*) is taken from the 1st singular and appears to be a post-Anatolian development.

Cognates:
Anatolian: No known Anatolian cognates. But cf. Hittite (3rd sg. pres. act.) *a-ra-a-i* (old script *a-ra-i*) ‘to (a)rise, to lift, to raise’ (originally *ḫi*-conjugation); Cuneiform Luwian (3rd sg. pres. act.) *a-ri-it-ta* ‘to raise’, (nom.-acc. pl.) ^{GIŠ}*a-ri-ya-la* ‘carrying basket’; Lycian (3rd sg. pres. act.) *erije* ‘to raise’.

Other: Sanskrit *árṣati* ‘to flow’, *árṇa-ḥ* ‘undulating, surging; wave’, *ṛccháti* ‘to go, to move, to send’, *ṛṇóti* ‘to go, to move, to arise’; Avestan *ar-* ‘to go, to move, to come’, *aurva-*, *aurvant-* ‘rapid, quick’, *ərənaoiti* ‘to set in motion’; Old Persian *ar-* ‘to move, to go or come toward’, *aruvā* ‘action’, *aruva-* ‘rapid, quick’; Greek ὄρνῡμι ‘to urge on, to incite, to move, to stir oneself, to make to arise’; Latin *orior* ‘to rise, to arise’.

Kloekhorst 2008a:196—197 **$h_1$ór-ei* / **h_1r-énti*, **h_1r-ské/ó-*; Puhvel 1984— .1/2:108—111 **er-* ‘to move, to stir, to raise’, 1/2:123—127 **E_1róy(H_2)-A_1ey*, 1/2:162—167 **r̥-new-* / **r̥-nu-*, and 1/2:170—172 **H_2ér-s-*, **H_2r-és-*; Friedrich 1991:27; Sturtevant 1936:25, 26, 28 and 1951:30, §56, Indo-Hittite **’ers-*, 32, §58, Indo-Hittite **’ore*; Rix 2001:241 **$h_1$ers-* ‘to flow’, 252 **$h_1$reḯ-* ‘to rise, to rise up’; Pokorny 1959:326—332 **er-*, **or-*, **r-* ‘to set in motion; to incite, to stir up, to arouse; to arise’; Walde 1927—1932.I:136—142 **er-*; Mann 1984—1987:249 **ersō* ‘to go, to glide, to wander, to creep, to dawdle’, 884 **or-* ‘to start, to start up, to rise’, 889 **orneu-*, **or-nū-mi* ‘to move, to rouse; to dash, to fly’, 891 **orsō*, *-i̯ō* ‘to go, to proceed, to flow, to slide, to glide, to creep’; Watkins 2000:23 **er-* ‘to move, to set in motion’ (oldest form **H$_1$er-*); Gamkrelidze—Ivanov 1995.I:187, I:194 **er-*/**r̥-*, **or-* ‘to rise, to get up; to come into motion; to attain’, I:172 **r̥neu-*, **ornu-* ‘to move’; Mallory—Adams 1977:506 **$h_1$er-* ‘to set in motion’; Mayrhofer 1956—1980.I:51, I:53, I:119 **er-*, and I:122; Boisacq 1950:714—716 **er-*, **ere-*; **erei-*, **ereu-*; Hofmann 1966:238—239 **er-*; **ereu-*, **erei-*; Chantraine 1968—1980.II:823—824 **er-*, **r̥-*; Frisk 1970—1973.II:422—424 **er-*; Beekes 2010.II:1107 **$h_1$er-* ‘to (a)rise’; Walde—Hofmann 1965—1972.II:222—223 **er-* (**ere-*, **erē-*); Ernout—Meillet 1979:468; De Vaan 2008:434—435. Note: Two separate Proto-Nostratic stems have fallen together in Proto-Indo-European: (A) **ʔor-* ‘to move rapidly, quickly, hastily; to set in motion’ (cf. Bomhard 2023.3:820—822, no. 691) and (B) **ʔor^{y}-* ‘to rise (up)’ (cf. Bomhard 2023.3:822—823, no. 692).

**woyt’-* ‘to know’:

	Proto-Indo-European	Sanskrit	Old Avestan	Homeric Greek	Gothic	Latin
Singular						
1	**wóyt’-H_2a*	*véda*	*vaēdā*	(ϝ)οἶδα	*wait*	*vīdī*
2	**wóyt’-t^{h}H$_2$a*	*véttha*	*vōistā*	(ϝ)οἶσθα	*waist*	*vīdistī*
3	**wóyt’-e*	*véda*	*vaēdā*	(ϝ)οἶδε	*wait*	*vīdit*
Plural						
1	**wit’-mé*	*vidmá*		(ϝ)ἴδμεν	*witum*	*vīdimus*
2	**wit’-é*	*vidá*		(ϝ)ἴστε	*wituþ*	*vīdistis*
3	**wit’-ḗr*	*vidúr*		(ϝ)ἴσ(σ)ᾱσι	*witun*	*vīdēre*, *-ĕrunt*

The Hittite personal endings may be summarized as follows (cf. Beckman 2011:527—528; Watkins 2004:566):

Active Present			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-mi*	*-ḫi*	*-weni, -meni*
2nd person	*-ši*	*-ti*	*-teni*
3rd person	*-zi*	*-i*	*-anzi*

Active Preterite			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-un*, *-nun*	*-ḫun*	*-wen, -men*
2nd person	*-š*	*-ta*, *t*	*-ten*
3rd person	*-t*	*-š*	*-ir*

Medio-Passive Present			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-(ḫ)ḫa(ri)*		*-wašta(ti)*
2nd person	*-ta(ri)*		*-tuma(ri)*
3rd person	*-ta(ri)*	*-a(ri)*	*-anta(ri)*

Medio-Passive Preterite			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-(ḫ)ḫat(i)*		*-waštati*
2nd person	*-tat(i)*		*-tumat(i)*
3rd person	*-ta(ti)*	*-a(ti)*	*-antat(i)*

Active Imperative			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-(a)llu*	*-(a)llu*	*-weni*
2nd person	*-Ø*, *-i*, *-t*	*-Ø*, *-i*	*-ten*
3rd person	*-tu*	*-u*	*-antu*

Medio-Passive Imperative			
	Singular		Plural
	mi-conjugation	*ḫi*-conjugation	
1st person	*-(ḫ)ḫaru*		*-waštati*
2nd person	*-ḫuti*		*-tumat(i)*
3rd person	*-taru*	*-aru*	*-antaru*

5.4. Proto-Indo-Anatolian Root Structure Patterning

A careful analysis of the root structure patterning led Benveniste to the discovery of the basic laws governing that patterning. According to Benveniste (1935:170—171), these laws may be stated as follows (see also Lehmann 1952:17—18) — this is a revised version, based upon the findings presented in this book:

1. The Proto-Indo-Anatolian root was monosyllabic, composed of the fundamental vowel (**ə* ~ **a*; **i*; **u*; probably also "original", that is, "non-apophonic", **ĕ* and **ŏ*) between two different consonants.
2. In this constant scheme: consonant plus vowel plus consonant (**CVC*-), the consonants could be of any order provided that they were different: however, the cooccurrence of both a voiceless stop and an aspirated voiced stop was forbidden.
3. The addition of a suffix to the root gave rise to two alternating stem types: Type 1: root in full-grade and accented, suffix in zero-grade (or reduced-grade); Type 2: root in zero-grade (or reduced-grade), suffix in full-grade and accented.
4. A single determinative could be added to the suffix, either after the suffix of stem Type 2, or, if *n*, inserted between the root element and the suffix of stem Type 2.
5. Further addition of determinatives or suffixes pointed to a nominal stem.

In the earliest form of Proto-Indo-Anatolian, there were three fundamental stem types: (A) verbal stems, (B) nominal and adjectival stems, and (C) pronominal and indeclinable stems.

The phonemicization of a strong stress accent in Early Proto-Indo-Anatolian disrupted the patterning outlined above. The positioning of the stress was morphologically distinctive, serving as a means to differentiate grammatical relationships. All vowels were retained when stressed but were either weakened (= "reduced-grade") or totally eliminated altogether (= "zero-grade") when unstressed: the choice between the reduced-grade versus the zero-grade depended upon the position of the unstressed syllable relative to the stressed syllable as well as upon the laws of syllabicity in effect at that time. Finally, it was at this stage of development that the syllabic allophones of the resonants came into being.

Thus, the stress-conditioned Ablaut alternations gave rise to two distinct forms of extended stems:

Type 1: Root in full-grade and accented, suffix in zero-grade: **CV́CC*-.
Type 2: Root in zero-grade, suffix in full-grade and accented: **CCV́C*-.

When used as a verbal stem, Type 1 could undergo no further extension. However, Type 2 could be further extended by means of a "determinative". Further addition of a determinative or suffixes pointed to a nominal stem (cf. Benveniste 1935:171; Lehmann 1952:17). According to Benveniste (1935:148), a "suffix" was characterized by two alternating forms (**-et-*/**-t-*, **-en-*/**-n-*, **-ek-*/**-k-*, etc.), while a "determinative" was characterized by a fixed consonantal form (**-t-*, **-n-*, **-k-*, etc.). Finally, Benveniste (1935:164) notes:

> … in the numerous cases where the initial [consonant group has been reconstructed in the shape] **(s)k-*, **(s)t-*, **(s)p-*, etc., with unstable sibilant, it is generally a question of prefixation, and it may be observed that the root begins with the [plain] consonant [alone excluding the sibilant].

In Pre-Indo-Anatolian, qualitative Ablaut most likely began as a purely phonological alternation. During the course of its development, however, these Ablaut alternations gradually became grammaticalized. We may venture a guess that prehistoric language contact with what was to become Proto-Northwest Caucasian was the impetus for the development of qualitative Ablaut (cf. Bomhard 2019a).

5.5. Concluding Remarks

In Chapter 2, we surveyed the phonological systems of the principal Anatolian daughter languages. In Chapter 3, we discussed the Proto-Indo-Anatolian laryngeals. In Chapter 4, we discussed the reconstruction of the Proto-Indo-Anatolian consonant system. Finally, in Chapter 5, we discussed the reconstruction of the Proto-Indo-Anatolian vowels. We are thus now in a position to present a complete reconstruction of the Proto-Indo-Anatolian phonological system:

Stops:	Bilabial	Dental	Velar[3]	Labiovelar
Voiceless aspirated:	p^h	t^h	k^h	k^{wh}
Glottalized (ejectives):[4]	p’	t’	k’	k’^{w}
Plain voiced:	b	d	g	g^w
Affricate:	$\widehat{ts}^h$			
Fricative:	s			
Laryngeals:				
Glottal stops:		ʔ	ʔ^w	
Glottal fricative:		h		
Velar fricatives: voiceless:		x	x^w	
voiced:		ɣ		
Pharyngeal/laryngeals: voiceless:		$\widehat{ħh}$	$\widehat{ħh}^w$	
voiced:		$\widehat{ʕɦ}$		
Nasals and Liquids:	m/m̥ n/n̥	l/l̥	r/r̥	
Glides:	w		y	

[3] The velar series may be assumed to have had non-phonemic palatalized allophones in certain environments (cf. Bomhard 2023.1:119—122). These allophones became phonemic in Luwian (cf. Melchert 2017:176) as well as in several of the non-Anatolian daughter languages — the so-called “satəm” languages.

[4] As previously noted, Kloekhorst (2016:226—228) considers this series to have been pre-glottalized in Proto-Anatolian.

Vowels:	i		u		
	e		o		
		ə ~ a			
Also the sequences:	iy	uy	ey	oy	əy ~ ay
	iw	uw	ew	ow	əw ~ aw

Note: According to Kloekhorst (2022:75), "Proto-Anatolian started to diverge sometime around the thirty-first century BCE" (note also the chart on p. 76).

For comparison, consider the following "Fortified Proto-Indo-European" phonological system reconstructed by Colarusso (1992:23) on the basis of a comparison with Northwest Caucasian:

Consonants:	p^h	b	-		m			w
	t^h	d	t'	s	n	r	l	
	k^{hy}	g^y	k'^y					
	(k^h	g	k')					
	k^{hw}	g^w	k'^w					
	q^h	-	q'	x	ɣ			
	q^{hw}	-	q'^w	x^w	$ɣ^w$			
				ḫ	ʕ			
				$ḫ^w$	$ʕ^w$			
		ʔ	h					
		$ʔ^w$						

Vowels: ə ~ a (plus tonal stress)

Note: Colarusso assumes that the laryngeals were lost in stages. The earliest laryngeals to be lost were **ʔ*, **h*, and **ʔ^w*. The loss of these laryngeals between preceding short vowels and a following obstruent gave rise to "inherently" long vowels. The remaining laryngeals underwent various changes and were eventually lost altogether prior to the emergence of the non-Anatolian daughter languages. Some laryngeal reflexes persisted in Anatolian.

Chapter 6
The Non-Anatolian Daughter Languages

6.1. Introduction

The present chapter discusses the development of the revised Proto-Indo-Anatolian phonological system down to so-called "Disintegrating Indo-European", the last stage of Proto-Indo-European proper, and ending with the various non-Anatolian Indo-European daughter languages, concentrating, especially, on Armenian, Old Indic (Old Indo-Aryan), Greek, and Italic. Here, Armenian has a crucial role to play in understanding the developments in the early prehistory of these daughter languages.

We will begin by looking at Disintegrating Indo-European and then discuss Tocharian, Germanic, Celtic, Slavic, Baltic, and Albanian, after which we will move on to Armenian and finish with Indo-Iranian, Greek, Italic, and Phrygian. For the sake of simplicity and continuity, I will repeat (and expand upon) some of what I have previously written.

6.2. Disintegrating Indo-European

At the end of the last chapter, I proposed that the Proto-Indo-Anatolian phonological system be reconstructed as follows:

Stops:	Bilabial	Dental	Velar	Labiovelar
Voiceless aspirated:	p^h	t^h	k^h	k^{wh}
Glottalized (ejectives):	p’	t’	k’	k’^{w}
Plain voiced:	b	d	g	g^w

Affricate:		$t\widesmile s^h$		
Fricative:		s		
Laryngeals:				
Glottal stops:		ʔ	ʔ^w	
Glottal fricative:		h		
Velar fricatives:	voiceless:	x	x^w	
	voiced:	ɣ		
Pharyngeal/laryngeals:	voiceless:	$\underset{\frown}{\text{ħh}}$	$\underset{\frown}{\text{ħh}}^w$	
	voiced:	$\underset{\frown}{\text{ʕɦ}}$		

Nasals and Liquids:	m/m̥	n/n̥	l/l̥	r/r̥
Glides:	w			y

Vowels:	i		u		
	e		o		
		ə ~ a			
Also the sequences:	iy	uy	ey	oy	əy ~ ay
	iw	uw	ew	ow	əw ~ aw

The following series of phonological changes may be assumed to have taken place in the Indo-European parent language after the separation of the Anatolian branch and before the emergence of the individual non-Anatolian Indo-European daughter languages:

1. The laryngeals *$ʔ$ and *h were lost initially before vowels.
2. *x and *$\underset{\frown}{ħh}$ merged into *$\underset{\frown}{ħh}$, while *$ɣ$ and *$\underset{\frown}{ʕɦ}$ merged into *$\underset{\frown}{ʕɦ}$.
3. Following that, *$\underset{\frown}{ħh}$ > *h and *$\underset{\frown}{ʕɦ}$ > *$ɦ$ > *h initially before vowels.
4. Next, all medial and final laryngeals merged into *h. This laryngeal no longer had any vowel-coloring effects.
5. Finally, the single remaining laryngeal *h was lost initially before vowels (except in Pre-Armenian) and medially between an immediately preceding vowel and a following non-syllabic. This latter change caused the compensatory lengthening of preceding short vowels, thus:

eHC	>	ēC
oHC	>	ōC
aHC	>	āC
iHC	>	īC
uHC	>	ūC

6. *h was preserved in all other positions. *h had a syllabic allophone, *$\underset{\circ}{h}$, when between two non-syllabics. This is the traditional schwa primum (*$ə$).
7. Glottalization was probably lost in late Disintegrating Indo-European itself just as the individual non-Anatolian daughter languages were beginning to emerge, though vestiges may have remained here and there in the daughter languages.
8. The earlier plain voiced stops developed into voiced aspirates, at least in some dialects of Disintegrating Indo-European.
9. The *e ~ *a (< *$ə$ ~ *a) qualitative Ablaut of Proto-Indo-Anatolian developed into an *e ~ *o Ablaut. This change may still have been in progress when the individual non-Anatolian daughter languages began to emerge.
10. New Ablaut relationships developed as a result of the loss of laryngeals and the growth of secondary full-grade forms.
11. Proto-Indo-Anatolian was a stress-accent language, whereas Proto-Indo-European became a pitch-accent language (for a general discussion of stress and stress-accent systems, cf. Hyman 1975:204—212 and, for pitch-accent systems, pp. 230—233).

For the latest period of development of the Indo-European parent language, the stage I call “Disintegrating Indo-European” — after the separation of the Anatolian branch from

the rest of the Indo-European speech community and before the emergence of the individual non-Anatolian Indo-European daughter languages —, the Proto-Indo-European antecedent of the satəm daughter languages may be reconstructed as follows (column 1 is voiceless aspirated, column 2 is glottalized [ejectives], and column 3 is voiced aspirated):

	(1)	(2)	(3)			
Obstruents:	p^h	p’	b^h	(bilabial)		
	t^h	t’	d^h	(dental)		
	k^{yh}	$k’^y$	g^{yh}	(palatovelar)		
	k^h	k’	g^h	(velar)		
	k^{wh}	$k’^w$	g^{wh}	(labiovelar)		
		s				
Laryngeals:		h/ḫ				
Resonants:	m/m̥	n/n̥	l/l̥	r/r̥	w/u	y/i
Vowels:	e	o	a	(i)	(u)	ə
	ē	ō	ā	ī	ū	

The most significant difference between the phonological system of the Disintegrating Indo-European antecedent of the satəm dialects and that of the centum dialects was in the treatment of the gutturals. In the centum dialects, the labiovelars did not become delabialized, and the palatovelars remained subphonemic.

The phonological system of the Disintegrating Indo-European antecedent of the centum daughter languages, on the other hand, may be reconstructed thus (column 1 is voiceless aspirated, column 2 is glottalized, and column 3 is voiced aspirated:

	(1)	(2)	(3)			
Obstruents:	p^h	p’	b^h	(bilabial)		
	t^h	t’	d^h	(dental)		
	k^h	k’	g^h	(velar)		
	k^{wh}	$k’^w$	g^{wh}	(labiovelar)		
		s				
Laryngeals:		h/ḫ				
Resonants:	m/m̥	n/n̥	l/l̥	r/r̥	w/u	y/i
Vowels:	e	o	a	(i)	(u)	ə
	ē	ō	ā	ī	ū	

Note: To repeat, even though I have reconstructed a series of voiced aspirates above (column 3), such sounds are really only needed to explain developments in Armenian, Old Indic (Old Indo-Aryan), Greek, and Italic, as we shall see below.

6.3. Tocharian

In Tocharian, the distinction between voiceless, glottalized, and voiced (traditional voiceless, voiced, and voiced aspirated) stops was eliminated. However, Tocharian originally preserved the older contrast. While this contrast still existed, **t'* was lost before non-syllabic resonants (cf. Van Windekens 1976—1982.I:82—83, §241), while **t^h* and **d* remained. The elimination of the older contrast must, therefore, have taken place after the loss of **t'* before non-syllabic resonants.

1. No doubt, the first step involved the deaspiration of the voiceless aspirates.
2. This was followed by the deglottalization of **p'*, **t'*, **k'*, and **k'^w* and their merger with the voiceless stops **p*, **t*, **k*, and **k^w*, respectively. This is shown by the fact that **mp* remained *mp*, while **mb* became *m* (cf. Van Windekens 1976—1982.I:79), and by the fact that **t* and **t'* had the same treatment before front vowels, namely, palatalization to *c*, while **d* went its own way under the same conditions — palatalization to **dz > ts* (cf. Van Windekens 1976—1982.I:83—84).
3. Last, the voiced stops were devoiced and merged with the plain voiceless stops.

These developments may be summarized as follows:

I Pre-Tocharian		II deaspiration		III deglottalization		IV devoicing
p^h, p', b	>	p, p', b	>	p, b	>	p (w)
t^h, t', d	>	t, t', d	>	t, d	>	t (c, ts)
k^h, k', g	>	k, k', g	>	k, g	>	k (ç)
k^{wh}, k'^w, g^w	>	k^w, k'^w, g^w	>	k^w, g^w	>	k(w/u) (k, ç)

**s* usually remained but was palatalized to *ṣ* before front vowels. The non-syllabic resonants generally remained.

The Disintegrating Indo-European vowels and diphthongs were greatly modified.

For details on the Tocharian developments, cf.: Adams 1988:36—42 and 2017:458—461; Gamkrelidze—Ivanov 1995.I:43—44; Hackstein 2017; Ringe 1996; Krause 1952 and 1955; Krause—Thomas 1960.I:61—68; Van Windekens 1976—1982.I:76—94.

6.4. Germanic

To begin, I would like to address a statement made by Fulk in his recent book *A Comparative Grammar of the Early Germanic Languages* (Fulk 2018:100):

> The chief implication of the glottalic theory for Germanic linguistics is that it permits Germanic (along with Armenian) to be regarded not as a highly innovative branch in its consonantism but as an exceptionally conservative one, whereas the IE languages usually regarded as hewing closest to the PIE consonant system, especially Sanskrit and Greek, turn out to do nothing of

> the sort. That Germanic should have remained so conservative while the European languages in closest proximity to it in prehistoric times all altered the inherited obstruents in similar ways is difficult to credit. And yet although the glottalic theory is not now widely supported, there is a considerable degree of concurrence that the reconstruction of PIE obstruents represented in §6.1 is implausible and awaits replacement by a creditable reconstruction. Nonetheless, it need not be the case that such an alternative reconstruction is what must be assumed for the latest stages of PIE, since it is of course possible that the typological peculiarities of PIE mentioned above are the consequence of an earlier obstruent system that had already changed before any of the extant IE families had developed individuating characteristics. That is to say, it is not a given that any IE language should directly reflect that earlier state of affairs rather than a later-developed obstruent system similar to that arrived at (in §6.1) by the comparative method. The supposition that Germanic is an especially archaic branch of IE is at all events unsupported by its verb system, which appears to be a simplification of that reconstructed for late PIE (§12.9), showing no marked resemblance to the Hittite verb system.

I do not understand the logic here. I see no problem whatsoever in viewing a particular language or branch as conservative in one area and innovative in another. This means that the innovations in the Germanic verb system do not preclude the retention of archaic features in the Germanic phonological system. (Note: This does not imply that there is any fault with Fulk's book as a whole — it is an excellent monograph and a valuable resource, comprehensive in scope and current in its coverage of the field.) This same point is made by Hejná—Walkden (2022:262) in their discussion of the difference in the rates of change of noun morphology as opposed to verb morphology between Old English and Middle English:

> If you pause at this point to compare the verbal endings in Old English with the ones presented for Middle English in the last chapter (§5.3.2), you'll see that on the whole there's not a huge amount of difference: the big changes in verbal morphology in English take place between the Middle and Modern periods. This is different for nominal morphology, which (as you'll soon see) is considerably more complex in Old English than in Middle English. This kind of fluctuation in rates of change is not unusual! It's not the case that all aspects of a language have to change at the same speed or at the same time, …

Germanic, like Armenian, is extremely conservative in its phonology — the Disintegrating Indo-European consonant system is preserved better in these two branches than in any of the other daughter languages (cf. Polomé 1982 on the archaic nature of Germanic). Unlike Armenian, however, Germanic preserves the older contrast between velars and labiovelars, though, in the course of development, they first became voiceless fricatives and then, at a later date and under certain specific conditions, voiced fricatives (see below for details). Armenian, on the other hand, belongs to the satəm group of languages and is, therefore, descended from that form of Disintegrating Indo-European in which this contrast was replaced by a contrast between palatovelars and plain velars.

In the Pre-Germanic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Germanic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Velar:	k^h	k	g
Labiovelar:	k^{wh}	k^w	g^w

Note: Glottalization may have been preserved in Pre-Germanic in series 2 above. Glottalization has been proposed to account for the vestjysk stød in Danish and Icelandic preaspiration (cf. Kortlandt 1988b).

The following series of changes may be postulated to account for the development of the Disintegrating Indo-European obstruent system into that found in Proto-Germanic:

1. The voiceless aspirates (series 1) become voiceless fricatives: *p^h, *t^h, *k^h, *k^{wh} > *f, *$þ$, *$χ$, *$χw$, except after *s-.
2. Later, the resulting voiceless fricatives became the voiced fricatives *$ƀ$, *$ð$, *$ɣ̄$, and *$ɣ̄w$, respectively, except (A) initially and (B) medially between vowels when the accent fell on the contiguous preceding syllable (Verner's Law). *s was also changed to *z under the same conditions. Cf. Fulk 2018:107—110.
3. *b remained initially, in gemination, and after nasals; *d initially, in gemination, and after nasals, *l, *z, and *g; and *g only in gemination and after nasals. In other positions, however, *b, *d, *g were changed into the voiced fricatives *$ƀ$, *$ð$, *$ɣ̄$, respectively. *g^w became *$ɣ̄$ initially and *w medially (cf. Wright—Wright 1925:131).

The resulting Proto-Germanic consonant system may thus be reconstructed as follows (cf. Fulk 2018:102—112; Moulton 1972):

	Stops		Fricatives	
Bilabial:	p	b	f	ƀ
Dental:	t	d	þ	ð
Velar:	k	g	χ	ɣ̄
Labiovelar:	kw	(gw)	χw	(ɣ̄w)

In Germanic, *a and *o merged into *a, and *$ā$ and *$ō$ merged into *$ō$. *e become *i (A) before a nasal plus consonant (*eNC > *iNC) and (B) when *i, *$ī$, or *y followed. *ey became *$ī$. *i was changed to *e and *u to *o when *a, *o, or *e appeared in the following syllable except when a nasal plus consonant intervened. In the sequences *$anχ$, *$inχ$, and *$unχ$, the n was lost, and the vowels were lengthened. *$m̥$, *$n̥$, *$l̥$, and *$r̥$ developed into *um, *un, *ul, and *ur, respectively.

The Proto-Germanic vowels and diphthongs may be reconstructed as follows:

Vowels:	i	u	ī	ū
	e		ē	ō
	a			

Diphthongs: ay aw ew

The consonantal resonants remained unchanged except that final **m* became **n*. This change is also found in Anatolian, Greek, Celtic, and probably Balto-Slavic.

The inner-Germanic developments are quite complicated, and Fulk's 2018 book mentioned above should be consulted for details. See also Stiles 2017; Bousquette—Salmons 2017:391—398.

6.5. Celtic

In the Pre-Celtic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Celtic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Velar:	k^h	k	g
Labiovelar:	k^{wh}	k^w	g^w

The following discussion will be confined to Old Irish; only the major developments will be discussed:

1. The earlier dental and velar ejectives (**t'* and **k'*) merged completely with their plain voiced counterparts (**d* and **g*) in Pre-Celtic. The developments may be assumed to have been ejective > plain voiceless stop (through deglottalization) > voiced stop (through voicing): **t' > *t > *d* and **k' > *k > *g*. There is no evidence in Proto-Celtic for an earlier bilabial ejective **p'*.
2. Next, the voiced labiovelar $*g^w$ was delabialized and merged with **g*.
3. Then, the glottalized labiovelar $*k'^w$ developed (A) into **b* initially and medially after consonants and (B) into **g* initially before **u* and medially between vowels and before consonants.
4. Original $*p^h$ was lost in all of the Celtic languages: $*p^h > *h > *\emptyset$. However, *p* has been reintroduced into Old Irish through loanwords.

The consonants developed positional allophones under various conditions:

1. Palatal allophones developed in the vicinity of original **i*, **ī*, **e*, and **ē*.
2. Velar allophones arose in the vicinity of original **u* and **ū*.
3. Neutral allophones were found in the vicinity of original **a*, **ā*, **o*, and **ō*.

In Old Irish, the palatal and velar allophones were indicated as such in writing by surrounding vowels. Unpronounced vowels were often introduced to indicate the quality of the following consonant. /p, t, c, b, d, g/ became the fricatives /f, θ, χ, v, ð, ɣ/ (written

ph, *th*, *ch*, *b*, *d*, *g*), respectively, initially after words that end or that formerly ended in a vowel and medially between vowels. /m, n, l, r/ became /μ, ν, λ, ρ/ (written *m*, *n*, *l*, *r*), respectively, and /s/ became /h/ under the same conditions. /μ/ was probably a nasalized /v/, while /ν, λ, ρ/ were lax variants of /n, l, r/. Consonants were changed as follows initially when the preceding word ended or formerly ended in a nasal:

1. /p, t, c/ became /b, d, g/ (written *p*, *t*, *c*)
2. /b, d/ first became /mb, nd/ and then /mm, nn/
3. /f/ became /v/ (written *b*)
4. /n/ was written before vowels
5. /s, r, l, m, n/ were doubled after proclitic vowels

Old Irish thus had the following system of consonants (the written form is given first followed by the allophones in slashes):

p	/p, b/		t	/t, d/		c	/k, g/
ph	/f/		th	/θ/		ch	/χ/
f	/f/		s	/s/			
b	/b, v/		d	/d, ð/		g	/g, ɣ/
m	/m, μ/		n	/n, ν/		[n]	/ŋ/
		l	/l, λ/		r	/r, ρ/	
		h	/h/				

Except for the merger of **ō* and **ā* into *á* and of **ī* and **ē* into *í*, the long and short vowels were mostly preserved in accented syllables. In unaccented syllables, vowels were either lost or subject to various modifications governed by a complicated set of rules. **i* and **u* became *e* and *o*, respectively, under the influence of *a* or *o* in the following syllable. **ew* and **ow* merged into *ó*/*úa*, **ey* became *é*/*ía*, **oy* became *óe*/*oí*, and **ay* became *aí*/*áe* in accented syllables. The Old Irish vowel system was as follows:

Vowels:	i	e	a	o	u
	í	é	á	ó	ú
Diphthongs:	íu	ía		úa	uí
		éu/éo		oí/óe	
		áu		ái/áe	

**y* was lost. **w* became *f* initially and *b* /v/ after *r*, *l*, *d*. **m*, **n*, **l*, **r* were preserved except that final **m* became *n*. In the sequences **Vnt*, **Vnc(h)*, and **Vns*, the **n* was lost, and the preceding vowel was lengthened. The developments of the syllabic nasals and liquids were complicated, though, in general, **m̥*, **n̥*, **l̥*, **r̥* became *am*, *an*, *al*, *ar*, respectively, before vowels and *em*, *en*, *li* (*le*), *ri* (*re*), respectively, elsewhere.

For details on the inner-Celtic developments, cf. Lewis—Pedersen 1937:1—157; Pedersen 1909 (vol. I); Sims—Williams 2017:361—367; Stifter 2017.

6.6. Slavic

In the Pre-Slavic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Slavic developments):

	(1)	(2)	(3)
Bilabial:	p^h	p	b
Dental:	t^h	t	d
Palatovelar:	k^{yh}	k^y	g^{yh}
Velar:	k^h	k	g
(Labiovelar:	k^{wh}	k^w	g^w)

Note: Glottalization may have remained in series 2 into Pre-Balto-Slavic. Glottalization has been proposed as an explanation for Winter's Law (on which, cf. Collinge 1985: 225—227).

In Pre-Slavic, Pre-Baltic, Pre-Indo-Iranian, Pre-Armenian, and Pre-Albanian (the so-called "satəm" languages), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. In the early prehistory of these branches, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.

The following series of changes may be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Slavic:

1. The ejectives merged completely with the plain voiced stops (**b*, **d*, **g^y*, and **g*) in Pre-Slavic. The development may be assumed to have been ejective > plain voiceless stop (through deglottalization) > voiced stop (through voicing): **p'* > **p* > **b*, **t'* > **t* > **d*, **k'^y* > **k^y* > **g^y*, and **k'* > **k* > **g*. The loss of glottalization caused lengthening of preceding contiguous short vowels (Winter's Law).
2. Then, the voiceless aspirates were deaspirated: **p^h*, **t^h*, **k^{yh}*, **k^h* > **p*, **t*, **k^y*, **k*. Note: there are a small number of examples in which **k^h* appears to become **x* in Proto-Slavic. These are best explained as borrowings, probably from Iranian (cf. Carlton 1991:95).
3. After **r*, **u*, **k*, **i*, **s* became **x* (> **š* before front vowels) (this is the so-called "ruki-rule"). A similar change is found in Indo-Iranian (see below).
4. **k^y* and **g^y* became **s* and **z*, respectively. No doubt, the developments were as follows: **k^y* > **t^y* > **$\underline{ts}$* > **s* and **g^y* > **d^y* > **$\underline{dz}$* > **z*.
5. **k* and **g* were palatalized to **č* and **ž*, respectively, before front vowels and **y*.
6. The syllabic resonants **$\underset{\circ}{m}$*, **$\underset{\circ}{n}$*, **$\underset{\circ}{l}$*, **$\underset{\circ}{r}$* developed into **i* (or **u*) plus **m*, **n*, **l*, **r*, thus: **$\underset{\circ}{m}$*, **$\underset{\circ}{n}$*, **$\underset{\circ}{l}$*, **$\underset{\circ}{r}$* > **im*, **in*, **il*, **ir*.

7. At a later date, **k* and **g* were palatalized to **c* and **dz*, respectively, before **ě* (< **oy*). **t*, **d*, **n*, **l*, **r* plus the semivowel **y* became **t^{y}*, **d^{y}*, **n^{y}*, **l^{y}*, **r^{y}*, respectively, while **s* became **š* under the same conditions.
8. **p*, **b*, **m*, **v* plus **y* became **pl^{y}*, **bl^{y}*, **ml^{y}*, **vl^{y}*, respectively.
9. **a* and **o* merged into **o*, and **ā* and **ō* merged into **a*. **ey* and **ī* both became **i*, and **oy* (< **ay* and **oy*) and **ē* became **ě*. **ū* became **y*, **i* became **ь*, and **u* became **ъ*. **e* plus a nasal became **ę* and **o* plus a nasal became **ǫ*. **ow* (< **aw* and **ow*) became **u*.

The Common Slavic phonological system may be reconstructed as follows:

Stops:	p	t	t^{y}	k		
	b	d	d^{y}	g		
Fricatives:	f	s	š	x		
		z	ž	(γ)		
Affricates:		c				
Nasals:	m	n	n^{y}			
Liquids:		r	r^{y}			
	l	l^{y}				
Semivowels:	v		j			
Vowels:			i	y	u	
	ь	ъ			ę	ǫ
	e	o	ě	a		

Note: The palatalized consonants may also be written as follows: **t′*, **d′*, **ń*, **ŕ*, **Ĺ*.

For details on the inner-Slavic developments, cf. Collins 2018; Marc L. Greenberg 2017:522—533; Kim 2018; Shevelov 1964.

6.7. Baltic

In the Pre-Baltic dialect of Disintegrating Indo-European, the glottalics were deglottalized, resulting in the following system, with the three-way contrast (1) voiceless aspirated ~ (2) plain (unaspirated) voiceless ~ (3) plain voiced (note: voiced aspirates are not needed in order to account for the Slavic developments):

	(1)	(2)	(3)
Bilabial:	p^{h}	p	b
Dental:	t^{h}	t	d
Palatovelar:	k^{yh}	k^{y}	g^{yh}
Velar:	k^{h}	k	g
(Labiovelar:	k^{wh}	k^{w}	g^{w})

The Baltic developments were fairly similar to the early Slavic developments (see above), except that **k^{y}* and **g^{y}* became **š* and **ž*, respectively. As in Pre-Slavic, the

ejectives merged completely with the plain voiced stops in Pre-Baltic. Lithuanian shows the change of **s* to **š* after **k* and **r* but not after **i* and **u* as in Slavic and Indo-Iranian. The syllabic resonants **m̥*, **n̥*, **l̥*, **r̥* developed into **i* (or **u*) plus **m*, **n*, **l*, **r*, thus: **m̥*, **n̥*, **l̥*, **r̥* > **im*, **in*, **il*, **ir*. In Lithuanian, *t* plus *j* (= *y*) and *d* plus *j* (= *y*) became *či* and *dži*, respectively; *t* plus *l* and *d* plus *l* became *kl* and *gl*, respectively.

Except for the merger of **a* and **o* into **a*, **ay* and **oy* into **ai*, and **aw* and **ow* into **au*, the vowel system remained reasonably faithful to that of Disintegrating Indo-European. Unlike Slavic and Germanic, Baltic did not merge Disintegrating Indo-European **ā* and **ō*.

The Common Baltic consonant system may be reconstructed as follows:

p	b	m	
t	d	n	
k	g	[ŋ]	
k^y (?)	g^y (?)	[n^y] (?)	
š	ž		
s	(z)		
r	l	y	w

For details on the inner-Baltic developments, cf. Kim 2018; Petit 2018; Young 2017: 489—499.

6.8. Albanian

Though the Albanian developments are still not completely understood, some tentative conclusions are possible.

1. In Pre-Albanian (as in Pre-Slavic, Pre-Baltic, Pre-Indo-Iranian, and Pre-Armenian), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. In the early prehistory of these branches, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*. Note: Albanian provides the strongest evidence for the existence of three distinct guttural series in its Disintegrating Indo-European ancestor: the labiovelars are distinguished from the plain velars by the fact that the former are palatalized to sibilants before front vowels, while the latter are not (cf. Mann 1977:24—25 and 34—35).
2. The ejectives were deglottalized: **p'*, **t'*, **k'ʸ*, **k'*, **k'ʷ* > **p*, **t*, **kʸ*, **k*, **kʷ*.
3. Then, the palatals became palatalized alveolars: **kʸʰ*, **kʸ*, **gʸ* > **tʸʰ*, **tʸ*, **dʸ*. These later developed into voiceless and voiced interdental fricatives (**tʸʰ*, **tʸ*, **dʸ* > **θʰ*, **θ*, **δ*).

4. Next, the plain voiceless stops (from earlier ejectives) became plain voiced stops: *p, *t, *k^y, *k, *k^w > *b, *d, *g^y, *g, *g^w. In general, the developments of the plain voiced stops and the former ejectives are identical, though initial *g^y (> *d^y) appears as *d*, while initial *k'^y appears as *dh* (cf. Mann 1977:33). This seems to indicate that the bilabial and dental stops may have developed ahead of and slightly differently from the palatal, velar, and labiovelar stops.
5. Finally, the voiceless aspirates were deaspirated: *p^h, *t^h, *t^{yh}, *k^h > *p, *t, *t^y, *k.

The Albanian developments may be summarized as follows:

	I palatalization of velars and (partial) delabialization of labiovelars		II deglottalization of ejectives		III palatals become palatalized alveolars	
Bilabial:	p^h, (p'), b	>	p^h, p, b	>	p^h, p, b	>
Dental:	t^h, t', d	>	t^h, t, d	>	t^h, t, d	>
Palatal:	k^{yh}, k'^{y}, g^y	>	k^{yh}, k^y, g^y	>	t^{yh}, t^y, d^y	>
Velar:	k^h, k', g	>	k^h, k, g	>	k^h, k, g	>
Labiovelar:	k^{wh}, k'^{w}, g^w	>	k^{wh}, k^w, g^w	>	k^{wh}, k^w, g^w	>

IV voicing of voiceless stops		V deaspiration of voiceless aspirates		VI Albanian
p^h, b	>	p, b	>	p, b
t^h, d	>	t, d	>	t, d
t^{yh}, $d^y{}_1$, $d^y{}_2$	>	t^y, $d^y{}_1$, $d^y{}_2$	>	th, d (dh), dh
k^h, g	>	k, g	>	k (q), g (gj)
k^{wh}, g^w	>	k^w, g^w	>	k (q, s), g (gj, z)

For details on the inner Albanian developments, cf.: Camaj 1984:1—8; De Vaan 2018; Hamp 1965a; Huld 1984:138—157; Mann 1977:24—25 and 32—36; Orël 2000:1—122; Rusakov 2017:560—572.

6.9. Armenian

In the early prehistory of Pre-Armenian, Pre-Indo-Iranian, Pre-Greek, and Pre-Italic, the glottalics first became plain voiceless stops (through deglottalization), and the voiced stops then became voiced aspirates. These were context-free developments. Next, at a later date, in Pre-Indo-Iranian, Pre-Greek, and Pre-Italic, but not in Pre-Armenian, the plain voiceless stops became voiced stops. Again, this was a context-free development in these

daughter languages. Armenian, however, preserves the first stage of this shift — that is to say, the plain voiceless stops remained as such and were not changed to voiced stops. Thus, the Classical Armenian phonological system directly attests the three-way contrast (1) voiceless aspirated ~ (2) plain voiceless ~ (3) voiced aspirated in its occlusive system (on the interpretation of the Classical Armenian sounds traditionally transcribed as /b/, /d/, /g/, /j/, and /ǰ/ as voiced aspirates, cf. Godel 1975:9—10; Garrett 1998; Schirru 2012; Seyfarth—Garellek 2018 [Yerevan dialect]).

This is not the whole story, however. There is a tremendous amount of variation in Modern Armenian dialects, in some cases even pointing to the retention of glottalization in series 2. On the other hand, in some dialects, plain voiceless stops correspond to the glottalics, while in still others, plain voiced stops are found (for details, cf. Fleming 2000; Martirosyan 2019:51—60; Vaux 1998). Thus, we have here, in a single, attested Indo-European branch, all of the changes that the glottalics are thought to have undergone in the various other non-Anatolian Indo-European daughter languages (retention, voicing, deglottalization)! There is no need to invoke typological parallels nor to formulate elaborate hypotheses — Armenian has it all!

For the Pre-Armenian dialect of Disintegrating Indo-European, the obstruent system may be reconstructed as follows, taking into consideration all of the evidence from the Modern Armenian dialects, as well as Classical Armenian (column 1 is voiceless aspirated, column 2 is glottalized, and column 3 is voiced aspirated):

	(1)	(2)	(3)	
Obstruents:	p^h	p’	b^h	(bilabial)
	t^h	t’	d^h	(dental)
	k^{yh}	k'^y	g^{yh}	(palatovelar)
	k^h	k’	g^h	(velar)

The following series of changes may be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Classical Armenian:

1. In Pre-Armenian (as in Pre-Slavic, Pre-Baltic, Pre-Albanian, and Pre-Indo-Iranian), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. Next, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars then merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.
2. Next, the glottalics were deglottalized: **p’*, **t’*, **k’*^{y}, **k’* > **p*, **t*, **k*^{y}, **k*. Note: There are no examples of **p’* in Armenian.
3. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*^{y}, **g* > **b*^{h}, **d*^{h}, **g*^{yh}, **g*^{h}. As mentioned above, this was a context-free development. It should be noted that Grassmann’s Law did not operate in Armenian (cf. Vennemann 1989:239).

4. The Pre-Armenian voiced aspirates remained except that, medially between vowels, *b^h > *w*, *g^{yh} > *j^h /d͡zʰ/ > *z*, and *g^h > *ž*, while *g^h remained initially before back vowels but was changed to *ǰ* /d͡žʰ/ before front vowels.
5. The syllabic resonants *$m̥$, *$n̥$, *$l̥$, *$r̥$ developed into *a* plus *m*, *n*, *l*, *r*: *$m̥$, *$n̥$, *$l̥$, *$r̥$ > *am*, *an*, *al*, *ar* (*ar̀* before *n*).
6. *l* became *ł* before consonants.
7. **w* became *g* or *v*.
8. **s* became *h* or *Ø* initially before vowels.
9. As in Indo-Iranian, Slavic, and Lithuanian, **s* became *š* after *r*.
10. **sk* and **ks* became *ç*.

At a later date, earlier clusters of voiceless stop plus laryngeal developed as follows (cf. Martirosyan 2010:716—717):

pH	>	p^h
tH	>	t^h
kH	>	x

In Armenian, some of the reflexes of the original voiceless aspirates merged with the reflexes of the new voiceless aspirates. This happened in the case of certain onomatopoeic terms, where, for example, original *p^h and *k^h appear as p^h and *x*, respectively, as if they were from earlier **pH* and **kH*. In like manner, the aspiration of the original voiceless aspirates was preserved in Armenian after initial **s*- (a similar development took place in Indo-Iranian). Finally, *t^h and **tH* have mostly merged in Armenian, though earlier *rt^h has become *rd*, while **rtH* has become rt^h (cf. Meillet 1967:104—105 and 1984:78—79).

The Armenian developments may be summarized as follows:

I Palatalization of velars and delabialization of labiovelars	II Deglottalization of ejectives	III Development of voiced aspirates	IV Classical Armenian (traditional transcription)
p^h, (p'), b	> p^h, (p), b	> p^h, (p), b^h	> h (w, Ø), -, b (w)
t^h, t', d	> t^h, t, d	> t^h, t, d^h	> t^h, t, d
k^{yh}, k'^y, g^y	> k^{yh}, k^y, g^y	> k^{yh}, k^y, g^{yh}	> s, c, j (z)
k^h, k', g	> k^h, k, g	> k^h, k, g^h	> k^h, k, g (ǰ, ž)

Note: As noted above, glottalization is preserved in some Modern Armenian dialects.

The Classical Armenian (Grabar) consonant system is as follows:

	Voiceless Aspirated	Voiceless Unaspirated	Voiced	Nasals
Stops	p^h	p	b	m
	t^h	t	d	n
	k^h	k	g	
Affricates	c^h	c	j	
	$č^h$	č	ǰ	
Fricatives		s	z	
		š	ž	
		h		
		x		
Liquids		l	ł	
		r	ṙ	
Glides		v w	y	

Notes:
1. The voiceless aspirated series is more often transcribed as follows: $p^ʿ$, $t^ʿ$, $k^ʿ$, $c^ʿ$, $č^ʿ$.
2. As noted above, /b/, /d/, /g/, /j/, and /ǰ/ were voiced aspirates.

Armenian is the only non-Anatolian daughter language that has preserved a trace of a consonantal laryngeal. Kuryłowicz's *$ə_2$ and *$ə_3$ (Sturtevant's *x and *γ) appear as *h* initially before full-grade vowels in a small number of words (cf. Winter 1965:102). The following examples have cognates in the Anatolian languages:

A. Armenian *hav* 'grandfather' (< Pre-Armenian **hawhos*): Hittite *ḫu-uḫ-ḫa-aš* 'grandfather'; Hieroglyphic Luwian *huhas* 'grandfather'; Lycian *χuga-* 'grandfather'. Cf. Latin *avus* 'grandfather'; Gothic *awō* (f.) 'grandmother'; Old Irish *áue* 'grandson'; Lithuanian *avýnas* 'uncle'. Puhvel 1984— .3:355—358; Kloekhorst 2008a:352—353.
B. Armenian *hoviw* 'shepherd' (< Pre-Armenian **howi-pā-*): Hittite (nom. sg. or pl. ?) *ḫa-a-u-e-eš* 'sheep'; Luwian *ḫa-a-ú-i-iš* 'sheep'; Hieroglyphic Luwian *hawis* 'sheep'; Lycian *χava* 'sheep'. Cf. Sanskrit *ávi-ḥ* 'sheep'; Greek ὄϊς, οἶς 'sheep'; Latin *ovis* 'sheep'; Lithuanian *avìs* 'sheep'. Kloekhorst 2008a:337—338 **h₃eu̯i-*; Puhvel 1984— .3:279—280; Wodtko—Irslinger—Schneider 2008:335—339.
C. Armenian *haravunkº* 'arable land' (< Pre-Armenian **har-* 'to plow'): Hittite *ḫar-aš-zi* 'to plow'. Cf. Greek ἀρόω 'to plow, to till'; Latin *arō* 'to plow, to till'; Gothic *arjan* 'to plow'; Lithuanian *ariù* 'to plow, to till'; Tocharian B *āre* 'plow'. But note Armenian *arawr* 'plow' without initial *h*. Puhvel (1984— .3:184—185), on the other hand, derives the Hittite form from Akkadian *ḫarāšu* 'to plant' or *ḫarāṣu* 'to dig a furrow'; but cf. Tischler 1977— :182—183; Kloekhorst 2008a:312—314.
D. Armenian *hogi* 'wind, spirit' (< Pre-Armenian **howyo-*), *hov* 'wind', *hovem* 'to let air in': Hittite *ḫu-wa-an-za* 'wind'. Cf. Sanskrit *vā́ti* 'to blow'; Greek ἄημι 'to blow, to breathe'; Latin *ventus* 'wind'; Gothic *winds* 'wind'; Tocharian A *want* 'wind'; Lithuanian *vė̃jas* 'wind'. Puhvel 1984— .3:428—429; Kloekhorst 2008a:368.

E. Armenian *han* ‘grandmother’ (< Pre-Armenian **hano-s*): Hittite (gen. pl.) *ḫa-an-na-aš* ‘grandmother’; Lycian *χñna-* or *χñni-* ‘grandmother’. Cf. Old High German *ana* ‘grandmother’; Latin *anus* ‘old woman’; Old Prussian *ane* ‘grandmother’. Puhvel 1984— .3:84—86; Kloekhorst 2008a:285—286.
F. Armenian *harkanem* ‘to split, to fell’ (< Pre-Armenian **hark’-*): Hittite *ḫar-ga-aš* ‘destruction, ruin’, *ḫa-ar-ak-zi* ‘to be destroyed’. Cf. Old Irish *orgaim* ‘to strike, to destroy’. This etymology is rejected by Puhvel 1984— .3:157—168; but cf. Kloekhorst 2008a:306—307; Benveniste 1935:162.
G. Armenian *haçi* ‘ash-tree’ (< Pre-Armenian **haskʸo-*): Hittite ^{GIŠ}*ḫa-aš-ši-ka₄-aš* ‘a tree and its fruit (?)’. Cf. Old Icelandic *askr* ‘ash-tree’; Old High German *ask* ‘ash-tree’. This comparison is not mentioned in Puhvel 1984— .3:232; but cf. Tischler 1977— :200—201; Kloekhorst 2008a:324.
H. Armenian *Hay* ‘Armenian’: Hittite *Ḫayaša* the name of a region (cf. Meillet 1936: 9). No doubt this term has been borrowed by Armenian.

The following examples have no known Anatolian cognates:

I. Armenian *hav* ‘bird’ (< Pre-Armenian **hawi-s*): Latin *avis* ‘bird’; Sanskrit *ví-ḥ* ‘bird’.
J. Armenian *hot* ‘smell’ (< Pre-Armenian **hot’os-*): Latin *odor* ‘smell’; Greek ὄζω ‘to smell’.
K. Armenian *hum* ‘raw’ (< Pre-Armenian **hōmo-s*): Sanskrit *ām#-ḥ* ‘raw’; Greek ὠμός ‘raw’.

The Armenian material is not without problems, however. Both Meillet (1936:38) and Winter (1965b:102) point out that initial *h* is unstable. This means that the same word sometimes has two alternates, one with *h-* and one without — Meillet’s example is *hogi* ‘wind, spirit’ beside *ogi*. Furthermore, *h-* is sometimes missing where the Hittite cognate unequivocally points to original **H₂* such as in Armenian *arcatʰ* ‘silver’ beside Hittite *ḫarkiš* ‘white’ (other cognates include Greek ἀργός ‘bright, white’ and Latin *argentum* ‘silver’). Consequently, the Armenian material, though extremely valuable, must be used with caution.

The Neogrammarians and their followers — with the exception of Ferdinand de Saussure — did not reconstruct laryngeals as part of the Proto-Indo-European phonological system. However, they had all of the tools at their disposal to do so. First of all, as early as 1878, de Saussure had posited his now famous “coefficients sonantiques” solely on the basis of an analysis of the patterns of vowel gradation. Secondly, Armenian has a clear reflex of one of de Saussure’s “coefficients”. Unfortunately, the Armenian evidence escaped detection until after the discovery in 1927 by Kuryłowicz that one of de Saussure’s “coefficients” was preserved in Hittite. It was only then that the Armenian material was re-examined by Austin (1942:22—25) and the laryngeal reflex found. It should be noted that Albert Cuny made the same discovery at the same time (1927) as Kuryłowicz.

For more information on the inner-Armenian developments, cf. Fleming 2000; Godel 1975:69—91; Macak 2017; Meillet 1936: 23—59; Vaux 1998; Martirosyan 2010:705—748.

6.10. Indo-Iranian

For the Pre-Indo-Iranian dialect of Disintegrating Indo-European, the obstruent system may be reconstructed as follows (column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization is not needed in order to account for the Indo-Iranian developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^{yh}	k^y	g^{yh}	(palatovelar)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

The changes leading from the Pre-Indo-Iranian to Proto-Indo-Iranian are particularly complicated. The first three steps are identical to what is assumed to have happened in Pre-Armenian (and also Pre-Greek and Pre-Italic).

1. In Pre-Indo-Iranian (as in Pre-Slavic, Pre-Baltic, Pre-Albanian, and Pre-Armenian), the velars developed palatalized allophones when contiguous with front vowels, apophonic **o*, and **y*. Next, the labiovelars were (perhaps only partially at first) delabialized. The newly delabialized (labio)velars then merged with the unpalatalized allophones of the velars. This change brought about the phonemicization of the palatals since both palatalized velars (from earlier plain velars) and unpalatalized velars (from earlier labiovelars) were now found in the vicinity of front vowels, apophonic **o*, and **y*.
2. Next, the glottalics were deglottalized: **p'*, **t'*, **k'*^{y}, **k'* > **p*, **t*, **k*^{y}, **k*.
3. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*^{y}, **g* > **b*^{h}, **d*^{h}, **g*^{yh}, **g*^{h}. This was a context-free development. This was the stage reached by Armenian.
4. When two voiced aspirates cooccurred in a root, the first was deaspirated (Grassmann's Law). It should be noted that Grassmann's Law only appears in Old Indic. In Iranian (Old Persian and Avestan), the plain voiced stops and the voiced aspirates have the same treatment (cf. Kent 1953:29).
5. In Pre-Indo-Iranian (and in Pre-Greek and Pre-Italic), but unlike Pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*^{y}, **k* > **b*, **d*, **g*^{y}, **g*. This was a context-free development. (As a typological parallel, it may be noted that an identical change has taken place in the Northwest Caucasian languages Šapsegh and Kabardian.)

	(1)	(2)	(3)	
Obstruents:	p^h	b	b^h	(bilabial)
	t^h	d	d^h	(dental)
	k^{yh}	k^y	g^{yh}	(palatovelar)
	k^h	g	g^h	(velar)
	k^{wh}	g^w	g^{wh}	(labiovelar)

6. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated:

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^h	b	b^h	(bilabial)
	t	t^h	d	d^h	(dental)
	k^y	k^{yh}	k^y	g^{yh}	(palatovelar)
	k	k^h	g	g^h	(velar)
	k^w	k^{wh}	g^w	g^{wh}	(labiovelar)

   The deaspiration took place everywhere except (A) after initial **s-* and (B) in onomatopoeia. However, aspiration was lost in the clusters **sp^h-*, **st^h-*, **sk^h-* when an earlier laryngeal followed in the stem or when another aspirated stop followed in the stem: **(s)t^heHy- > *(s)teHy- > *(s)tāy-* (cf. Sanskrit *stāyati* 'he, she steals', *stāyú-ḥ*, *tāyú-ḥ* 'thief, robber'); **(s)t^heHi- > *(s)teHi- > *(s)tai-* (cf. Sanskrit *stená-ḥ* 'thief', *stéya-ḥ* 'theft, robbery'). **(s)t^henH- > *(s)tenH- > *(s)ten-* (cf. Sanskrit *stanati* 'resounds, reverberates'). Note: Apparent exceptions to these rules appear to be due to the generalization of variant forms of the stems in question, or, in some cases, they are due to borrowing.
7. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH > *p^h*, **t^h*, **k^h*, respectively.
8. **s* was changed into **š* after **r*, **u*, **k*, **i* (this is the so-called "ruki-rule"). A similar change is also found in Slavic.
9. **k^y*, **g^y*, **g^{yh}* were affricated to **t͡s*, **d͡z*, **$d͡z^h$*, respectively (cf. Burrow 1973:74).
10. Following that, the velars **k*, **g*, **g^h* were palatalized to **k^y*, **g^y*, **g^{yh}*, respectively, before **ĕ*, **ĭ*, and **y* (cf. Mayrhofer 1972:24). Note: **k^h* was not palatalized.
11. After the palatalization of the velars had taken place, the short vowels merged into **a*, and the long vowels merged into **ā*. Earlier **o* became *ā* in open syllables (Brugmann's Law).
12. The syllabic nasals became *a*, and the syllabic laryngeal (**ḫ̥*) partially merged with *i*.
13. **h* was then lost after *a* (< **m̥* and **n̥*) with compensatory lengthening.
14. **r* and **l* merged into *r*, and **r̥* and **l̥* merged into *r̥*.

In Avestan and Old Persian, the plain and aspirated voiced stops merged. The voiceless aspirates became fricatives except after a sibilant, where they were deaspirated. The plain voiceless stops developed into fricatives when immediately followed by a consonant unless a sibilant preceded.

In Old Indic (Vedic and Classical Sanskrit), **d͡z* and **g^y* merged into *j*, and **$d͡z^h$* and **g^{yh}* merged into *h*.

The Old Indic phonological system was as follows (column 1 is plain voiceless, column 2 is voiceless aspirated, column 3 is plain voiced, column 4 is voiced aspirated, and column 5 is nasal (cf. Burrow 1973:67—117; Kobayashi 2017:231; Mayrhofer 1972:17):

	(1)	(2)	(3)	(4)	(5)		
Velar:	k	kh	g	gh	ṅ		
Palatal:	c	ch	j	jh	ñ		
Retroflex:	ṭ	ṭh	ḍ	ḍh	ṇ		
Dental:	t	th	d	dh	n		
Bilabial:	p	ph	b	bh	m		
Semivowels:	y	r	l	v			
Sibilants:	ś	ṣ	s				
Aspirate:	h						
Visarga:	ḥ						
Anusvāra:	ṁ						
Vowels:	a	i	u	ṛ	ḷ	e	o
	ā	ī	ū	ṝ			
Diphthongs:	ai	au					

Once the above system was established, it remained remarkably stable for well over three thousand years — the phonological systems of the modern Indo-Aryan languages remain to this day similar in structure to the phonological system of Old Indic (cf. Bloch 1965:96—97; Kobayashi 2004; see Ghatage 1962 for examples). This fact raises an interesting question about the phonological system reconstructed for the Indo-European parent language by the Neogrammarians: The Neogrammarian reconstruction is extremely close to the phonological system of Old Indic. If the Neogrammarian system were in fact an accurate representation of what had existed in Proto-Indo-European, one may legitimately ask why it, too, did not remain stable in the majority, if not all, of the Indo-European daughter languages. It thus seems to be a fair conclusion that the Proto-Indo-European phonological system was not in fact similar to that of Old Indic and that the Old Indic system was an innovation.

6.11. Greek

For the Pre-Greek dialect of Disintegrating Indo-European, the obstruent system may be reconstucted as follows (column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization in is not needed in order to account for the Greek developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

Many of the early Pre-Greek developments were similar to what is assumed to have happened in Pre-Armenian and Pre-Indo-Iranian. However, Greek is a so-called “centum”

language, which means that it initially preserved the original contrast between velars and labiovelars. Unlike Pre-Armenian and Pre-Indo-Iranian, but similar to Italic, Greek changed the voiced aspirates into voiceless aspirates.

The following series of changes may be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Greek:

1. First, the glottalics were deglottalized: **p'*, **t'*, **k'*, **k'^{w}* > **p*, **t*, **k*, **k^{w}*.
2. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*, **g^{w}* > **b^{h}*, **d^{h}*, **g^{h}*, **g^{wh}*. This was a context-free development.
3. As in Old Indic, when two voiced aspirates cooccurred in a root, the first was deaspirated (Grassmann's Law).
4. In Pre-Greek (and in Pre-Indo-Iranian and Pre-Italic), but unlike Pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*, **k^{w}* > **b*, **d*, **g*, **g^{w}* (cf. Gamkrelidze—Ivanov 1995.I:52—57). This was a context-free development.

	(1)	(2)	(3)	
Obstruents:	p^{h}	b	b^{h}	(bilabial)
	t^{h}	d	d^{h}	(dental)
	k^{h}	g	g^{h}	(velar)
	k^{wh}	g^{w}	g^{wh}	(labiovelar)

5. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated.

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^{h}	b	b^{h}	(bilabial)
	t	t^{h}	d	d^{h}	(dental)
	k	k^{h}	g	g^{h}	(velar)
	k^{w}	k^{wh}	g^{w}	g^{wh}	(labiovelar)

Note: Emonds (1972:120) also assumes that some of the examples of voiceless aspirates found in Indo-Iranian, Greek, and Armenian are derived from the original voiceless aspirates, that is to say, they failed to undergo the expected deaspiration. Edmonds accounts for this by "reintroduction from a dialect that did not undergo Z2 [deaspiration]". In other words, he sees them as borrowings. While this may be true in some cases, I prefer to see them mostly as the natural result of developments within these branches themselves.

6. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH* > **p^{h}*, **t^{h}*, **k^{h}*, respectively.
7. At a later date, the voiced aspirates were devoiced — the unaspirated allophones became plain (unaspirated) voiceless stops, and the aspirated allophones became voiceless aspirates: **b* ~ **b^{h}*, **d* ~ **d^{h}*, **g* ~ **g^{h}*, **g^{w}* ~ **g^{wh}* > **p* ~ **p^{h}*, **t* ~ **t^{h}*, **k* ~ **k^{h}*, **k^{w}* ~ **k^{wh}*. The newly-formed plain and aspirated voiceless stops merged completely with the previously-existing plain and aspirated voiceless stops. As a

typological parallel, it may be noted that similar devoicing of earlier voiced aspirates took place in Romany (cf. Meillet 1967:100 and 1984:76).

The labiovelars were eliminated in Greek in historic times. The process of elimination probably occurred in several stages. Since the labiovelars mostly remain in Mycenaean, their elimination can reasonably be placed between the Mycenaean period and the beginning of the alphabetic period, that is, between about 1400—900 BCE (cf. Lejeune 1972:43—53). The developments were as follows:

1. Before or after *u*, *k^w, *k^{wh}, and *g^w were delabialized, and the resulting phonemes merged with *k*, k^h, and *g* (written κ, χ, and γ), respectively.
2. Next, *k^w, *k^{wh}, and *g^w were palatalized before $\breve{e}$ and $\breve{\imath}$. The resulting sounds then merged with *t*, t^h, and *d* (written τ, θ, and δ), respectively, in the majority of Greek dialects.
3. Finally, all remaining labiovelars became bilabials: *k^w, *k^{wh}, and *g^w > *p*, p^h, and *b* (written π, φ, and β).

**m*, **n*, **l*, **r* generally remained in Greek except that final **-m* became *-n* (written ν) as in Anatolian, Germanic, Celtic, and probably Baltic and Slavic. *$m̥$, *$n̥$, *$l̥$, *$r̥$ developed into αμ, αν, αλ, αρ, respectively, before vowels. Before consonants, *$m̥$ and *$n̥$ merged into α, while *$l̥$ and *$r̥$ became αλ/λα and αρ/ρα, respectively.

**s*, **y*, and **w* were lost medially between vowels. Initially before vowels, **s* became *h* (written ʽ), **y* became either *h* or *z* (written ʽ and ζ, respectively), while **w* was lost in Attic-Ionic. **s* remained when final and when before or after voiceless stops.

The vowels and diphthongs were well-preserved in all of the Greek dialects. The most important change was that of ᾱ to η in Attic-Ionic. Additional changes worth mentioning include the compensatory lengthening of short vowels, the shortening of long vowels, and the development of new long vowels through contraction. For more information on the Greek developments, cf. Lejeune 1972:187—263.

6.12. Italic

Italic is divided into two distinct branches, namely, Oscan-Umbrian (also called Sabellian or Sabellic) and Latin-Faliscan. The Oscan-Umbrian branch includes a number of poorly-attested languages besides Oscan and Umbrian — these include Aequian, Marrucinian, Marsian, Paelignian, Sabinian, Southern Picenian, Vestinian, and Volscian (cf. Sihler 1995:14). The differences between Oscan-Umbrian, on the one hand, and Latin-Faliscan, on the other, are extremely pronounced, so much so that some scholars deny any special relationship between these two groups and see them instead as two separate branches of Indo-European (for details about the issues involved, cf. Beeler 1966:51—58).

For the Pre-Italic dialect of Disintegrating Indo-European, the obstruent system may be reconstructed as follows (column 1 is voiceless aspirated, column 2 is plain voiceless, and column 3 is voiced aspirated) (note: glottalization is not needed in order to account for the Italic developments of series 2):

	(1)	(2)	(3)	
Obstruents:	p^h	p	b^h	(bilabial)
	t^h	t	d^h	(dental)
	k^h	k	g^h	(velar)
	k^{wh}	k^w	g^{wh}	(labiovelar)

Many of the early Pre-Italic developments were similar to what is assumed to have happened in Pre-Greek. Like Greek, Italic belonged to the so-called "centum" languages, which means that it initially preserved the original contrast between velars and labiovelars.

The following series of changes may be postulated for the development of the Disintegrating Indo-European system of obstruents into the system found in Proto-Italic:

1. First, the glottalics were deglottalized: **p'*, **t'*, **k'*, **k'^{w}* > **p*, **t*, **k*, **k^w*.
2. Then, the plain voiced stops became voiced aspirates: **b*, **d*, **g*, **g^w* > **b^h*, **d^h*, **g^h*, **g^{wh}*. This was a context-free development. Note: Grassmann's Law did not operate in Italic.
3. In Pre-Italic (and in Pre-Indo-Iranian and Pre-Greek), but unlike Pre-Armenian, the plain (unaspirated) voiceless stops (from earlier glottalics) developed into plain (unaspirated) voiced stops: **p*, **t*, **k*, **k^w* > **b*, **d*, **g*, **g^w* (cf. Gamkrelidze—Ivanov 1995.I:57—65). This was a context-free development.

	(1)	(2)	(3)	
Obstruents:	p^h	b	b^h	(bilabial)
	t^h	d	d^h	(dental)
	k^h	g	g^h	(velar)
	k^{wh}	g^w	g^{wh}	(labiovelar)

4. The imbalance caused by the voicing of the plain voiceless stops caused the voiceless aspirates to be partially deaspirated.

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^h	b	b^h	(bilabial)
	t	t^h	d	d^h	(dental)
	k	k^h	g	g^h	(velar)
	k^w	k^{wh}	g^w	g^{wh}	(labiovelar)

5. Additional voiceless aspirates arose from earlier clusters of voiceless stop plus laryngeal: **pH*, **tH*, **kH* > **p^h*, **t^h*, **k^h*, respectively.
6. At a later date, the voiced aspirates were devoiced: **b^h*, **d^h*, **g^h*, **g^{wh}* > **p^h*, **t^h*, **k^h*, **k^{wh}*. The newly-formed aspirated voiceless stops merged completely with the previously-existing aspirated voiceless stops.
7. Finally, the voiceless aspirates (from earlier voiced aspirates as well as from clusters of voiceless stop plus laryngeal) became voiceless fricatives.

b^h	>	p^h	>	φ	>	f
d^h	>	t^h	>	θ	>	f
g^h	>	k^h	>	χ	>	h
g^{wh}	>	k^{wh}	>	χ^w	>	f

In Oscan and Umbrian, *φ, *θ, and *χ^w merged into *f*, while *χ became *h*. In Latin, the merger of *φ, *θ, and *χ^w into *f* only took place initially. *φ became *b* medially; *θ became (A) *d* medially but (B) *b* before or after *r*, before *l*, or after *u*; and *χ^w became (A) *v* between vowels, (B) *gu* after *n*, but (C) *g* before consonants or *u*. *χ became (A) *h* initially in Latin but (B) *g* when before or after consonants and (C) *f* when before *u*.

**m*, **n*, **l*, **r* were preserved. **y* remained initially in Latin (written *i*) but was lost between vowels, while **w* (written *v*) was unchanged. *$\underset{\circ}{m}$, *$\underset{\circ}{n}$, *$\underset{\circ}{l}$, *$\underset{\circ}{r}$ developed into *a* plus *m*, *n*, *l*, *r*, respectively, before vowels. Elsewhere, *$\underset{\circ}{l}$ and *$\underset{\circ}{r}$ became *ol* and *or*, respectively, and *$\underset{\circ}{m}$ and *$\underset{\circ}{n}$ became *em* and *en*, respectively.

**s* generally remained, though it was voiced to *z* between vowels. The *z* was retained in Oscan but was changed to *r* in Umbrian and Latin.

The vowels generally remained in accented syllables but were weakened or lost in unaccented syllables. The vowels underwent the following modifications in Latin. Final *i* became *e*. *e* became *i* before *ng*, *gn*, *nc*, and *ngu*. *e* became *o* before or after *w* and before *l*. *o* became *u* (1) before *nc*, *ngu*, *mb*, and before *l* plus a consonant, (2) in final syllables ending in a consonant, and (3) medially before *l* or before two consonants. *vo* became *ve* before *r* plus a consonant, before *s* plus a consonant, and before *t*. *ov* became *av*.

The diphthongs were preserved in Oscan but underwent various changes in Umbrian and Latin. *ei* became *ī*, and *oi*, *eu*, and *ou* became *ū* in Latin.

For details on the inner-Italic developments, cf. Buck 1933:78—167 (Latin and Greek); Lindsay 1894:219—315; Meisser 2017:743—751; Sihler 1995: 35—242 (Latin and Greek); Stuart-Smith 2004; Wallace 2017: 325—329; Weiss 2009:31—193.

6.13. Phrygian and Thracian

Like Germanic and Armenian, Phrygian is usually considered to be a relic area in which the Proto-Indo-European stop system is better preserved than it is in the remaining daughter languages (cf. Gamkrelidze—Ivanov 1995.I:804—805). Unfortunately, the Phrygian corpus is so small that it is not possible to trace all of the developments with certainty. However, the following developments are clear (except as noted) (cf. Diakonoff—Neroznak 1985:5—6; Neroznak 1992:272—274; Ligorio—Lubotsky 2013:184—187 and 2018:1821—1824; Fortson 2010:461—462; Georgiev 1981:131—132; Obrador-Cursach 2020:62—76; R. Woodhouse 2006 and 2010):

Proto-Indo-European		Phrygian
b	>	b
p^h	>	p (also ph)
d	>	d
t^h	>	t (also th)

t’	>	t
g, g^{w}	>	g
k^{h}, k^{wh}	>	k (also kh)
k’, k’^{w}	>	k
g^{y}	>	z (?)
k^{y}	>	s (?)
k’^{y}	>	z (?)

Note: The reflexes of the palatovelars are unclear. According to Fortson (2010: 461) and Obrador-Cursach (2020:70), Phrygian was a centum language, as was most certainly Thraco-Dacian (cf. Vinereanu 2023).

As can be seen, the voiced stops remained unchanged. The voiceless aspirates also remained unchanged, though the aspiration is usually not indicated in the writing. Finally, the glottalics were simply deglottalized. It should be mentioned, however, that this interpretation is challenged by Brixhe (1994:171—172 and 2004:782).

Phrygian had five short vowels (*a*, *e*, *i*, *o*, *u*) and at least four long vowels (*ā*, *ī*, *ō*, *ū*), though the long vowels were not indicated in the writing. Proto-Indo-European **ē* and **ā* merged into *ā* in Phrygian. Cf. Obrador-Cursach 2020:62.

The Thracian developments appear to be similar to those given above for Phrygian (cf. Georgiev 1981:118—119; see also Brixhe—Panayotou 1994a:198—199; Katičić 1976.I: 128—153), though this interpretation has recently been called into question by the work of Svetlana Yanakijeva.

6.14. Concluding Remarks

The phonological developments in each Indo-European branch are far more complicated than indicated in this chapter. Only the main lines of development have been traced here, the principal purpose being to show how the Glottalic Model of Proto-Indo-European consonantism can account for the phonological developments in the main non-Anatolian Indo-European daughter languages in a completely natural, straightforward, and plausible manner. To that end, trajectories of the developments in each branch have been provided. The various comparative grammars and handbooks listed in the references at the end of this book should be consulted for details about further developments in the various daughter languages.

Particular emphasis has been placed in this chapter on Armenian as the key to understanding the developments in Old Indic, Greek, and Italic. It may be noted that the trajectories for each of these branches leads directly to the traditional, Neogrammarian system of stops at a certain period in their prehistory (cf. Joseph—Wallace 1994) (column 1 is plain voiceless, column 2 is voiceless aspirated, column 3 is plain voiced, and column 4 is voiced aspirated):

	(1)	(2)	(3)	(4)	
Obstruents:	p	p^h	b	b^h	(bilabial)
	t	t^h	d	d^h	(dental)
	k^y	k^{yh}	k^y	g^{yh}	(palatovelar)
	k	k^h	g	g^h	(velar)
	k^w	k^{wh}	g^w	g^{wh}	(labiovelar)

This is identical to Brugmann's reconstruction (1904:52), though Brugmann uses a different transcription from that given above, namely:

	(1)	(2)	(3)	(4)	
Occlusives:	p	ph	b	bh	(bilabial)
	t	th	d	dh	(dental)
	k̂	k̂h	ĝ	ĝh	(palatal)
	q	qh	g	gh	(pure velar)
	q̬	q̬h	g̬	g̬h	(labiovelar)

However — and this must be strongly emphasized —, such a reconstruction is only needed to account for developments in these branches. This is clearly a late development in the Disintegrating Indo-European antecedents of Old Indic, Greek, and Italic and is not in any way representative of earlier periods of development within the Indo-European parent language.

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